Project Manual

CAREER TECH CENTER
MACHINE SHOP

Madison County, Alabama

Architect's Project Number 22256

Alabama DCM Number 2022152

July 27, 2022

Nola | VanPeursem Architects, PC • 301 Jefferson Street • Huntsville, AL 35801

SECTION 00 01 01

TITLE PAGE

PROJECT MANUAL FOR:

PROJECT:	Career Tech Center Machine Shop Madison County, Alabama
RELEASE DATE:	July 27, 2022
ARCHITECT'S PROJECT NUMBER:	22256
DCM NUMBER:	2022152
OWNER:	Madison County Board of Education 1275-F Jordan Road Huntsville, AL 35811 (256) 852-2557
CIVIL ENGINEER:	Johnson & Associates Engineering 1218 Church Street Huntsville, AL 35801 (256) 533-7331 Phone
ARCHITECT:	Nola | VanPeursem Architects, PC 301 Jefferson Street Huntsville, AL 35801 (256) 533-6617 Phone
STRUCTURAL ENGINEER:	P.R. Matthewson & Associates Engineers, Inc. 4835 University Square, Suite 17 Huntsville, AL 35816 (256) 652-6818 Phone
MECHANICAL ENGINEER:	Mechanical Design Services, Inc. 305 Jefferson Street, Suite D Huntsville, Alabama 30801 (256) 534-5150 Phone
ELECTRICAL ENGINEER	Hyde Engineering, Inc. 1525 Perimeter Parkway, Suite 275 Huntsville, Alabama 35806 (256) 270-8013 Phone

END OF SECTION

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BID DOCUMENTS AND FORMS

PART 1 GENERAL

1.01 DOCUMENTS

A. Advertisement for Bids - DCM Form C-1, dated August 2021.

B. Instructions to Bidders - DCM Form C-2, dated August 2021.

C. Proposal Form - DCM Form C-3, dated August 2021.

D. Accounting of Sales Tax - DCM Form C-3A-Sales Tax, dated August 2021.

E. Bid Bond - DCM Form C-4, dated August 2021.

1.02 DOCUMENT AVAILABILITY

A. A copy of the documents and forms noted above is attached hereto, as provided by the Alabama Department of Finance, Real Property Management.

B. Additional copies may be obtained from the office of the Alabama Department of Finance, Real Property Management, 770 Washington Avenue, Suite 470, Montgomery, Alabama 36104, phone (334) 242-4082 or www.realproperty.alabama.gov

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

ADVERTISEMENT FOR BIDS

Sealed proposals will be received by Madison County Board of Education at 1275-F Jordan Road, Huntsville, Alabama 35811 until 2:00 p.m. CDT August 16, 2022 for

Career Tech Center
Machine Shop

at which time and place they will be publicly opened and read.

A cashier's check or bid bond payable to Madison County Board of Education in an amount not less than five (5) percent of the amount of the bid, but in no event more than $10,000, must accompany the bidder's proposal. Performance and Payment Bonds and evidence of insurance required in the bid documents will be required at the signing of the Contract.

Drawings and specifications may be examined at the office of Nola | VanPeursem Architects, PC, 301 Jefferson St., Huntsville, Alabama 35801; Phone (256) 533-6617, after August 2, 2022.

Bid Documents may be obtained from the Architect upon deposit of $250.00 per set, which will be refunded in full on the first 2 sets issued to each general contract bidder submitting a bona fide bid, upon return of documents in good condition within ten days of bid date. Other sets for general contractors, and sets for subcontractors and dealers, may be obtained with the same deposit, which will be refunded as above, less cost of printing, reproduction, handling, and distribution.

There will be a Pre-Bid Meeting for this project on Tuesday, August 9, 2022 at 3:30 p.m. at the project site.

Bids must be submitted on proposal forms furnished by the Architect or copies thereof. All bidders bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the provisions of Title 34, Chapter 8, Code of Alabama, 1975, and must show evidence of license before bidding or bid will not be received or considered by the Architect; the bidder shall show such evidence by clearly displaying his or her current license number on the outside of the sealed envelope in which the proposal is delivered. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owner's judgment, the best interests of the Owner will thereby be promoted.

Nonresident bidders must accompany any written bid documents with a written opinion of an attorney at law licensed to practice law in such nonresident bidder's state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that state in the letting of any or all public contracts.

Notice of Sales & Use Tax Exemption: Materials incorporated into the Work are exempt from sales and use tax pursuant to Alabama Act No. 2013-205 (effective October 1, 2013). The Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, and Business Tax Division of the Alabama Department of Revenue regarding certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors. The Owner shall not consider claims for additional costs resultant of the contractor's, or its subcontractors', failure to comply with such rules and regulations.

Madison County Board of Education
(Awarding Authority)
Nola | VanPeursem Architects, PC
(Architect)

Advertisement to run:
Friday, July 15, 2022
Wednesday, July 20, 2022
Wednesday, July 27, 2022

INSTRUCTIONS TO BIDDERS

CONTENTS

1. BID DOCUMENTS:

The Bid Documents consist of the Advertisement for Bids, these Instructions to Bidders, any supplements to these Instructions to Bidders, the Proposal Form and the Accounting of Sales Tax, and the proposed Contract Documents. The proposed Contract Documents consist of the Construction Contract, the Performance Bond and Payment Bond, the Conditions of the Contract (General, Supplemental, and other Conditions), Drawings, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

2. GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

When the amount bid for a contract exceeds $50,000, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. In case of a joint venture of two or more contractors, the amount of the bid shall be within the maximum bid limitation as set by the State Licensing Board for General Contractors of the combined limitations of the partners to the joint venture.

3. QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

a. Any special qualifications required of general contractors, subcontractors, material suppliers, or fabricators are set forth in the Bid Documents.

b. The Awarding Authority may have elected to prequalify bidders. Parties interested in bidding for this contract are directed to the Advertisement for Bids and Supplemental Instructions to Bidders to determine whether bidders must be prequalified and how they may obtain copies of the Awarding Authority's published prequalification procedures and criteria.

c. Release of Bid Documents by the Architect to a prospective bidder will not constitute any determination by the Awarding Authority or Architect that the bidder has been found to be qualified, prequalified, or responsible.

4. PREFERENCE to RESIDENT CONTRACTORS:
(If this project is federally funded in whole or in part, this Article shall not apply.)

a. In awarding the Contract, preference will be given to Alabama resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded the Contract only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances.

b. A nonresident bidder is a contractor which is neither organized and existing under the laws of the State of Alabama, nor maintains its principal place of business in the State of Alabama. A nonresident contractor which has maintained a permanent office within the State of Alabama for at least five continuous years shall not thereafter be deemed to be a non-resident contractor so long as the contractor continues to maintain a branch office within Alabama.

5. EXAMINATION of BID DOCUMENTS and the SITE of the WORK:

Before submitting a bid for the Work, the bidders shall carefully examine the Bid Documents, visit the site, and satisfy themselves as to the nature and location of the Work, and the general and local conditions, including weather, the general character of the site or building, the character and extent of existing work within or adjacent to the site and any other work being performed thereon at the time of submission of their bids. They shall obtain full knowledge as to transportation, disposal, handling, and storage of materials, availability of water, electric power, and all other facilities in the area which will have a bearing on the performance of the Work for which they submit their bids. The submission of a bid shall constitute a representation by the bidder that the bidder has made such examination and visit and has judged for and satisfied himself or herself as to conditions to be encountered regarding the character, difficulties, quality, and quantities of work to be performed and the material and equipment to be furnished, and as to the contract requirements involved.

6. EXPLANATIONS and INTERPRETATIONS:

a. Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.

b. Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.

c. In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

7. SUBSTITUTIONS:

a. The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer's name, model number, etc. (hereinafter referred to as "source"), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph "d" below apply.

b. When the Bid Documents identify only one or two sources, or three or more sources followed by "or approved equal" or similar wording, the bidder's proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without "Pre-bid Approval" as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.

c. When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not identified in the Bid Documents or granted "Pre-Bid Approval" will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.

d. If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder's proposal must be based upon the identified sole source.

e. Procedures for "Pre-bid Approval". If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect's discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

8. PREPARATION and DELIVERY of BIDS:

a. DCM Form C-3: Proposal Form:

(1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted. A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with the Proposal Form.

(2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.

(3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:

- **(a)** the legal name of the bidder,
- **(b)** the state under which laws the bidder's business is organized and existing,
- **(c)** the city (and state) in which the bidder has its principal offices,
- **(d)** the bidder's business organization, i.e., corporation, partnership, or individual (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and
- **(e)** the partners or officers of the bidder's organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert "See Attachment" in this space and provide the listing on an attachment to the Proposal Form.

(4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.

(5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.

(6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.

(7) The Proposal Form shall be properly signed by the bidder. If the bidder is:

- **(a)** **an individual**, that individual or his or her "authorized representative" must sign the Proposal Form;
- **(b)** **a partnership,** the Proposal Form must be signed by one of the partners or an "authorized representative" of the Partnership;
- **(c)** **a corporation,** the president, vice-president, secretary, or "authorized representative" of the corporation shall sign and affix the corporate seal to the Proposal Form.

As used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying the bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation) and shall be attached to the Proposal Form.

(8) Interlineation, alterations or erasures on the Proposal Form must be initialed by the bidder or its "authorized representative".

b. DCM Form C-3A: Accounting of Sales Tax

A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

c. Bid Guaranty

(1) The Proposal Form must be accompanied by a cashier's check, drawn on an Alabama bank, or a Bid Bond, executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority.

(2) If a Bid Bond is provided in lieu of a cashier's check, the bond shall be on the Bid Bond form as stipulated in the Bid Documents.

(3) The amount of the cashier's check or Bid Bond shall not be less than five percent of the contractor's bid, but is not required to be in an amount more than ten thousand dollars.

d. Delivery of Bids:

(1) Bids will be received until the time set, and at the location designated, in the Advertisement for Bids unless notice is given of postponement. Any bid not received prior to the time set for opening bids will be rejected absent extenuating circumstances and such bids shall be rejected in all cases where received after other bids are opened.

(2) Each bid shall be placed, together with the bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters "Proposal", below which the bidder shall identify the Project and the Work bid on, the name of the bidder, and the bidder's current general contractor's state license number.

(3) Bids may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, the sealed envelope containing the bid, marked as indicated above, shall be enclosed in another envelope for mailing.

9. WITHDRAWAL or REVISION of BIDS:

a. A bid may be withdrawn prior to the time set for opening of bids, provided a written request, executed by the bidder or the bidder's "authorized representative", is filed with the Architect prior to that time. The bid will then be returned to the bidder unopened.

b. A bid which has been sealed in its delivery envelope may be revised by writing the change in price on the outside of the delivery envelope over the signature of the bidder or the bidder's "authorized representative". In revising the bid in this manner, the bidder must only write the amount of the change in price on the envelope **and must not reveal the bid price.**

c. Written communications, signed by the bidder or its "authorized representative", to revise bids will be accepted if received by the Architect prior to the time set for opening bids. The Architect will record the instructed revision upon opening the bid. Such written communication may be by facsimile if so stipulated in Supplemental Instructions to Bidders. In revising the bid in this manner, the bidder must only write the amount of the change in price **and must not reveal the bid price.**

d. Except as provided in Article 12 of these Instructions to Bidders, no bid shall be withdrawn, modified, or corrected after the time set for opening bids.

10. OPENING of BIDS:

a. Bids will be opened and read publicly at the time and place indicated in the Advertisement for Bids. Bidders or their authorized representatives are invited to be present.

b. A list of all proposed major subcontractors and suppliers will be submitted by Bidders to the Architect at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. If the list includes a fire alarm contractor and/or fire sprinkler contractor, Bidders will also submit a copy of the fire alarm contractor's and/or fire sprinkler contractor's permits from the State of Alabama Fire Marshal's Office.

11. INCOMPLETE and IRREGULAR BIDS:

A bid that is not accompanied by data required by the Bid Documents, or a bid which is in any way incomplete, may be rejected. Any bid which contains any uninitialed alterations or erasures, or any bid which contains any additions, alternate bids, or conditions not called for, or any other irregularities of any kind, will be subject to rejection.

12. BID ERRORS:

a. Errors and Discrepancies in the Proposal Form. In case of error in the extension of prices in bids, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

b. Mistakes within the Bid. If the low bidder discovers a mistake in its bid, the low bidder may seek withdrawal of its bid without forfeiture of its bid guaranty under the following conditions:

(1) Timely Notice: The low bidder must notify the Awarding Authority and Architect in writing, within three working days after the opening of bids, that a mistake was made. This notice must be given within this time frame whether or not award has been made.

(2) Substantial Mistake: The mistake must be of such significance as to render the bid price substantially out of proportion to the other bid prices.

(3) Type of Mistake: The mistake must be due to calculation or clerical error, an inadvertent omission, or a typographical error which results in an erroneous sum. A mistake of law, judgment, or opinion shall not constitute a valid ground for withdrawal without forfeiture.

(4) Documentary Evidence: Clear and convincing documentary evidence of the mistake must be presented to the Awarding Authority and the Architect as soon as possible, but no later than three working days after the opening of bids.

The Awarding Authority's decision regarding a low bidder's request to withdraw its bid without penalty shall be made within 10 days after receipt of the bidder's evidence or by the next regular meeting of the Awarding Authority. Upon withdrawal of bid without penalty, the low bidder shall be prohibited from (1) doing work on the project as a subcontractor or in any other capacity and (2) bidding on the same project if it is re-bid.

13. DISQUALIFICATION of BIDDERS:

Any bidder(s) may be disqualified from consideration for contract award for the following reasons:

a. Collusion. Any agreement or collusion among bidders or prospective bidders in restraint of freedom of competition to bid at a fixed price or to refrain from bidding or otherwise shall render the bids void and shall cause the bidders or prospective bidders participating in such agreement or collusion to be disqualified from submitting further bids to the Awarding Authority on future lettings. (See § 39-2-6, Code of Alabama 1975, for possible criminal sanctions.)

b. Advance Disclosure. Any disclosure in advance of the terms of a bid submitted in response to an Advertisement for Bids shall render the proceedings void and require re-advertisement and rebid.

c. Failure to Settle Other Contracts. The Awarding Authority may reject a bid from a bidder who has not paid, or satisfactorily settled, all bills due for labor and material on other contracts in force at the time of letting.

14. CONSIDERATION of BIDS:

a. After the bids are opened and read publicly, the bid prices will be compared and the results of this comparison will be available to the public. Until the final award of the contract, however, the Awarding Authority shall have the right to reject any or all bids, and it shall have the right to waive technical errors and irregularities if, in its judgment, the bidder will not have obtained a competitive advantage and the best interests of the Awarding Authority will be promoted.

b. If the Bid Documents request bids for projects or parts of projects in combination or separately, the Bid Documents must include supplements to, these Instructions to Bidders setting forth applicable bid procedures. Award or awards will be made to the lowest responsible and responsive bidder or bidders in accordance with such bid procedures.

15. DETERMINATION of LOW BIDDER by USE of ALTERNATES:

a. The Awarding Authority may request alternate bid prices (alternates) to facilitate either reducing the base bid to an amount within the funds available for the project or adding items to the base bid within the funds available for the project. Alternates, if any, are listed in the

Proposal Form in the order in which they shall cumulatively deduct from or add to the base bid for determining the lowest bidder.

b. If alternates are included in the Proposal Form, the Awarding Authority shall determine the dollar amount of funds available and immediately prior to the opening of bids shall announce publicly the funds available for the project. The dollar amount of such funds shall be used to determine the lowest bidder as provided herein below, notwithstanding that the actual funds available for the project may subsequently be determined to be more or less than the expected funds available as determined immediately prior to the time of the opening of bids.

c. If the base bid of the lowest bidder exceeds the funds available and alternate bid prices will reduce the base bids to an amount that is within the funds available, the lowest bidder will be determined by considering, in order, the fewest number of the alternates that produces a price within the funds available. If the base bid of the lowest bidder is within the funds available and alternate bid prices will permit adding items to the base bid, the lowest bidder will be determined by considering, in order, the greatest number of the alternates that produces a price within the funds available.

d. After the lowest bidder has been determined as set forth above, the Awarding Authority may award that bidder any combination of alternates, provided said bidder is also the low bidder when only the Base Bid and such combination of alternates are considered.

16. UNIT PRICES:

a. Work Bid on a Unit Price Basis. Where all, or part(s), of the planned Work is bid on a unit price basis, both the unit prices and the extensions of the unit prices constitute a basis of determining the lowest responsible and responsive bidder. In cases of error in the extension of prices of bids, the unit price will govern. A bid may be rejected if any of the unit prices are obviously unbalanced or non-competitive.

b. Unit Prices for Application to Change Orders. As a means of predetermining unit costs for changes in certain elements of the Work, the Bid Documents may require that the bidders furnish unit prices for those items in the Proposal Form. Unit prices for application to changes in the work are not a basis for determining the lowest bidder. Non-competitive unit prices proposed by the successful bidder may be rejected and competitive prices negotiated by the Awarding Authority prior to contract award. Unit prices for application to changes in the work are not effective unless specifically included and agreed upon in the Construction Contract.

17. AWARD of CONTRACT:

a. The contract shall be awarded to the lowest responsible and responsive bidder unless the Awarding Authority finds that all the bids are unreasonable or that it is not in the best interest of the Awarding Authority to accept any of the bids. A responsible bidder is one who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the contract. A responsive bidder is one who submits a bid that complies with the terms and conditions of the Advertisement for Bids and the Bid Documents. Minor irregularities in the bid shall not defeat responsiveness.

b. A bidder to whom award is made will be notified by telegram, confirmed facsimile, or letter to the address shown on the Proposal Form at the earliest possible date. Unless other

time frames are stipulated in Supplemental Instructions to Bidders, the maximum time frames allowed for each step of the process between the opening of bids and the issuance of an order to proceed with the work shall be as follows:

(1)	Award of contract by Awarding Authority	30 calendar days after the opening of bids
(2)	Contractor's return of the fully executed contract, with bonds and evidence of insurance, to the Awarding Authority	15 calendar days after the contract has been presented to the contractor for signature (from the Lead Design Professional)
(3)	Awarding Authority's approval of the contractor's bonds and evidence of insurance and completion of contract execution	20 calendar days after the contractor presents complete and acceptable documents to the Architect
(4)	Notice To Proceed issued to the contractor along with distribution of the fully executed construction contract to all parties.	15 calendar days after final execution of contract by the Awarding Authority, by various State Agencies if required and by the Governor if his or her signature on the contract is required by law

The time frames stated above, or as otherwise specified in the Bid Documents, may be extended by written agreement between the parties. Failure by the Awarding Authority to comply with the time frames stated above or stipulated in Supplemental Instructions to Bidders, or agreed extensions thereof, shall be just cause for the withdrawal of the contractor's bid and contract without forfeiture of bid security.

c. Should the successful bidder or bidders to whom the contract is awarded fail to execute the Construction Contract and furnish acceptable Performance and Payment Bonds and satisfactory evidence of insurance within the specified period, the Awarding Authority shall retain from the bid guaranty, if it is a cashier's check, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded and the amount of the bid of the next lowest responsible and responsive bidder, but not more than $10,000. If no other bids are received, the full amount of the bid guaranty shall be so retained or recovered as liquidated damages for such default. Any sums so retained or recovered shall be the property of the Awarding Authority.

d. All bid guaranties, except those of the three lowest bona fide bidders, will be returned immediately after bids have been checked, tabulated, and the relation of the bids established. The bid guaranties of the three lowest bidders will be returned as soon as the contract bonds and the contract of the successful bidder have been properly executed and approved. When the award is deferred for a period of time longer than 15 days after the opening of the bids, all bid guaranties, except those of the potentially successful bidders, shall be returned. If no award is made within the specified period, as it may by agreement be extended, all bids will be rejected, and all guaranties returned. If any potentially successful bidder agrees in writing to a stipulated extension in time for consideration of its bid and its bid was guaranteed with a cashier's check, the Awarding Authority may permit the potentially successful bidder to substitute a satisfactory bid bond for the cashier's check.

END of INSTRUCTIONS TO BIDDERS

PROPOSAL FORM

To: _____ Date: _____
(Awarding Authority)

In compliance with the Advertisement for Bids and subject to all the conditions thereof, the undersigned

_____
(Legal Name of Bidder)

hereby proposes to furnish all labor and materials and perform all work required for the construction of

WORK _____

_____

in accordance with Drawings and Specifications, dated _____, prepared by

_____, Architect/Engineer.

The Bidder, which is organized and existing under the laws of the State of _____,

having its principal offices in the City of _____,

is: ☐ a Corporation ☐ a Partnership ☐ an Individual ☐ (other) _____.

LISTING OF PARTNERS OR OFFICERS: If Bidder is a Partnership, list all partners and their addresses; if Bidder is a Corporation, list the names, titles, and business addresses of its officers:

_____

_____

_____

BIDDER'S REPRESENTATION: The Bidder declares that it has examined the site of the Work, having become fully informed regarding all pertinent conditions, and that it has examined the Drawings and Specifications (including all Addenda received) for the Work and the other Bid and Contract Documents relative thereto, and that it has satisfied itself relative to the Work to be performed.

ADDENDA: The Bidder acknowledges receipt of Addenda Nos._____ through _____ inclusively.

BASE BID: For construction complete as shown and specified, the sum of _____

_____ Dollars ($ _____)

ALTERNATES: If alternates as set forth in the Bid Documents are accepted, the following adjustments are to be made to the Base Bid:

For Alternate No. 1 (. . . . .) ☐ (add) ☐ (deduct) $ _____
(Insert key word for Alternate)

For Alternate No. 2 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 3 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 4 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 5 (. . . . .) ☐ (add) ☐ (deduct) $ _____

For Alternate No. 6 (. . . . .) ☐ (add) ☐ (deduct) $ _____

UNIT PRICES - (Attach to this Proposal Form the unit prices, if any, on a separate sheet.)

BID SECURITY: The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within fifteen calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within 30 calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply.

Attached hereto is a: (*Mark the appropriate box and provide the applicable information.*)

☐ Bid Bond, executed by _____ as Surety,

☐ a cashier's check on the _____ Bank of _____,

for the sum of _____

Dollars ($ _____) made payable to the Awarding Authority.

BIDDER'S ALABAMA LICENSE:

State License for General Contracting: _____
License Number Bid Limit Type(s) of Work

CERTIFICATIONS: The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids.

Legal Name of Bidder _____

Mailing Address _____

* **By (Legal Signature)** _____

* Name & Title (print) _____ (*Seal*)

Telephone Number _____

Email Address _____

* If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.

Note: A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

ACCOUNTING OF SALES TAX
Attachment to DCM Form C-3: Proposal Form

To: _____ Date: _____
(Awarding Authority)

NAME OF PROJECT _____

_____

SALES TAX ACCOUNTING

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

ESTIMATED SALES TAX AMOUNT

BASE BID: $_____

Alternate No. 1 (……..) ☐(add) ☐(deduct) $_____
(Insert key word for Alternate)

Alternate No. 2 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 3 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 4 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 5 (……..) ☐(add) ☐(deduct) $_____

Alternate No. 6 (……..) ☐(add) ☐(deduct) $_____

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

Legal Name of Bidder _____

Mailing Address _____

***By (Legal Signature)** _____

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

*Title _____

Telephone Number _____

Email Address _____

Note: A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A with DCM Form C-3 is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

Do not staple this form; use clips.

DCM Form C-4
August 2021

BID BOND

The **PRINCIPAL** (*Bidder's company name and address*)
Name:
Address:

The **SURETY** (*Company name and primary place of business*)
Name:
Address:

The **OWNER** (*Entity name and address*)
Name:
Address:

The **PROJECT** for which the Principal's Bid is submitted: (*Project name as it appears in the Bid Documents*)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned Principal and Surety, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the **PENAL SUM of five percent (5%) of the amount of the Principal's bid, but in no event more than Ten-thousand Dollars ($10,000.00)**.

THE CONDITION OF THIS OBLIGATION is that the Principal has submitted to the Owner the attached bid, which is incorporated herein by reference, for the Project identified above.

NOW, THEREFORE, if, within the terms of the Bid Documents, the Owner accepts the Principal's bid and the Principal thereafter either:

(a) executes and delivers a Construction Contract with the required Performance and Payment Bonds (each in the form contained in the Bid Documents and properly completed in accordance with the bid) and delivers evidence of insurance as prescribed in the Bid Documents, or

(b) fails to execute and deliver such Construction Contract with such Bonds and evidence of insurance, but pays the Owner the difference, not to exceed the Penal Sum of this Bond, between the amount of the Principal's Bid and the larger amount for which the Owner may award a Construction Contract for the same Work to another bidder,

then, this obligation shall be null and void, otherwise it shall remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligation of the Surety under this Bond shall not in any manner be impaired or affected by any extension of the time within which the Owner may accept the Principal's bid, and the Surety does hereby waive notice of any such extension.

SIGNED AND SEALED this _____ day of _____, _____.

ATTEST:

_____

PRINCIPAL:

_____

By _____

_____
Name and Title

SURETY:

ATTEST:

_____

_____

By_____

_____
Name and Title

Note: Do not staple this form; use clips. Purpose: quickly and efficiently scan thousands of documents into DCM's database.

SECTION 00 22 00

OWNER'S SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.01 SUPPLEMENTS

A. The following instructions are in addition to State of Alabama Divison of Construction Management Instructions to Bidders - DCM Form C-2, dated August 2021, and the Advertisement for Bids - DCM Form C-1, dated August 2021.

1.02 TIME

A. Perform the Work within the time stated in Section 01 10 00 - Summary. The bidder, in submitting an offer, accepts the contract time period stated for performing the Work.

1.03 INSTRUCTIONS

A. All sealed bids will be received by 2:00 p.m. CDT on August 16, 2022 at which time each bidder must submit a sealed envelope properly titled containing the Proposal form, the Bid Bond, Accounting of Sales Tax form, Supplement B - List of Unit Prices (Section 00 43 22). Upon receipt of these documents the bids will be publicly opened and read aloud. Supplement A - List of Subcontractors (Section 00 43 21) is to be faxed to the Architect within 24 hours of the bid. No changes to the base bid will be allowed after 2:00 p.m.

B. Bids will be opened at the main office of the Madison County Board of Education, located 1275-F Jordan Road, Huntsville, AL 35811.

C. Any parties other than General Contractors may obtain contract documents for the cost of reproduction and postage by depositing $250.00 to Nola | VanPeursem Architects, PC for each set obtained. On return of such documents in good condition within 10 days after the bid opening, the cost of reproduction and postage and mailing will be deducted from the deposit and the balance of deposit will be refunded. No refund will be made if plans are not returned in good condition.

D. General Contractors who submit a bonafide bid will be refunded in full on the first two (2) sets issued. Additional sets may be obtained under the conditions stated in the above Item C.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 50 00

CONSTRUCTION DOCUMENTS AND FORMS

PART 1 GENERAL

1.01 DOCUMENTS

A. Construction Contract - DCM Form C-5, dated August 2021.

B. Checklist for Preparation and Approval of Construction Contracts and Bonds - DCM Form B-7, dated July 2022.

C. Performance Bond - DCM Form C-6, dated July 2022.

D. Payment Bond - DCM Form C-7, dated July 2022.

E. General Conditions of the Contract - DCM Form C-8, dated July 2022..

F. Supplementary Conditions of the Contract.
   1. Permit Fee & Permit Re-Inspection Fee Calculation Worksheet, dated December 2021.
   2. Appendix A.
   3. Appendix B.
   4. Appendix C.

G. General Contractor's Roofing Guarantee - DCM Form C-9, dated August 2021.

H. Application and Certificate for Payment, DCM Form C-10, dated July 2022.

I. Inventory of Stored Materials, DCM Form C-10SM, dated October 2021.

J. Schedule of Values, DCM Form C-10SOV, dated October 2021.

K. Final Payment Checklist, DCM Form B-13, dated July 2022.

L. Progress Schedule and Report, DCM Form C-11, dated August 2021.

M. Contract Change Order, DCM Form C-12, dated August 2021.

N. Change Order Justifications, DCM Form B-11, dated August 2021.

O. Change Order Checklist, DCM Form B-12, dated July 2022.

P. Certificate of Substantial Completion, DCM Form C-13, dated August 2021.

Q. Form of Advertisement of Completion, DCM Form C-14, dated August 2021.

R. Contractor's Affidavit of Paymnet of Debts & Claims, DCM Form C-18, dated August 2021.

S. Contractor's Affidavit for Relese of Liens, DCM Form C-19, dated August 2021.

T. Consent of Surety to Final Payment, DCM Form C-20, dated August 2021.

U. Pre-Construction Conference Checklist, DCM Form B-8, dated November 2021.

V. Alabama State Disclosure Statement.

1.02 DOCUMENT AVAILABILITY

A. A copy of the documents and forms noted above is attached hereto, as provided by the Alabama Department of Finance, Real Property Management.

B. Additional copies may be obtained from the office of the Alabama Department of Finance, Real Property Management, 770 Washington Avenue, Suite 470, Montgomery, Alabama 36104, phone (334) 242-4082 or www.realproperty.alabama.gov

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

(1) *Do not staple this form and/or attachments; use clips. Print single-sided; do not submit double-side printed documents.*

DCM (BC) Project No.

CONSTRUCTION CONTRACT

Numbers in margin correspond to "Checklist", DCM Form B-7

(2) This Construction Contract is entered into this day of in the year of

(3) between the **OWNER,**
Entity Name:
Address:
Email & Phone #:

(4) and the **CONTRACTOR,**
Company Name:
Address:
Email & Phone #:

(5) for the **WORK** of the Project, identified as:

(6) The **CONTRACT DOCUMENTS** are dated and have been amended by
(7) **ADDENDA**

(8) The **ARCHITECT** is
Firm Name:
Address:
Email & Phone #:

(9) The **CONTRACT SUM** is
Dollars ($) and is the sum of the Contractor's Base Bid for the Work and the following
(10) **BID ALTERNATE PRICES:**

(11) The **CONTRACT TIME** is ( ) calendar days.

THE OWNER AND THE CONTRACTOR AGREE AS FOLLOWS: The Contract Documents, as defined in the General Conditions of the Contract (DCM Form C-8), are incorporated herein by reference. The Contractor shall perform the Work in accordance with the Contract Documents. The Owner will pay and the Contractor will accept as full compensation for such performance of the Work, the Contract Sum subject to additions and deductions (including liquidated damages) as provided in the Contract Documents. The Work shall commence on a date to be specified in a Notice to Proceed issued by the Owner or the Director, Alabama Division of Construction Management, and shall then be substantially completed within the Contract Time.

(12) **LIQUIDATED DAMAGES** for which the Contractor and its Surety (if any) shall be liable and may be required to pay the Owner in accordance with the Contract Documents shall be equal to six percent interest per annum on the total Contract Sum unless a dollar amount is stipulated in the following space, in which case liquidated damages shall be determined at _____ dollars ($_____) per calendar day.

Numbers in margin correspond to "Checklist", DCM Form B-7

(13) **SPECIAL PROVISIONS** *(Special Provisions may be inserted here, such as acceptance or rejection of unit prices. If Special Provisions are continued in an attachment, identify the attachment below)*:

(14) **STATE GENERAL CONTRACTOR'S LICENSE:** The Contractor does hereby certify that Contractor is currently licensed by the Alabama State Licensing Board for General Contractors and that the certificate for such license bears the following:

License No.:

Classification(s):

Bid Limit:

The Owner and Contractor have entered into this Construction Contract as of the date first written above and have executed this Construction Contract in sufficient counterparts to enable each contracting party to have an originally executed Construction Contract each of which shall, without proof or accounting for the other counterparts, be deemed an original thereof.

The Owner does hereby certify that this Construction Contract was let in accordance with the provisions of Title 39, Code of Alabama 1975, as amended, and all other applicable provisions of law, and that the terms and commitments of this Construction Contract do not constitute a debt of the State of Alabama in violation of Article 11, Section 213 of the Constitution of Alabama, 1901, as amended by Amendment Number 26.

(15)

APPROVAL

ALABAMA STATE DEPARTMENT OF EDUCATION (SDE)
(*Required for locally-funded, SDE projects.*)

By_____ Date:_____
State Superintendent of Education

CONTRACTING PARTIES

_____
Contractor Company

By _____
Signature

Name & Title _____

_____
Owner Entity

By _____
Signature

Name(s) & Title(s) _____

Review/Signature flow: Architect/Engineer (prepare documents) > Contractor (review and sign) > Architect/Engineer (review) > Owner (review and sign) > SDE (review, sign and distribute the fully executed Contract to all parties, and forward a copy to the Alabama Division of Construction Management [DCM]). Note: DCM does not sign fully locally-funded SDE project contract documents.

PREPARATION AND APPROVAL OF
CONSTRUCTION CONTRACTS* and *BONDS
SUBMITTED ON PAPER

CHECKLIST

Use with DCM Forms C-5, C-6, & C-7
and DCM Forms 9-A, 9-B, & 9-C

CONSTRUCTION CONTRACT - DCM Form C-5 or DCM Form 9-A (PSCA Projects)

Six copies of documents with original signatures required. The numbers in the left column below correspond to numbers in the left margin of the Contract form. If the project is funded partially or fully by the Alabama Public School and College Authority (PSCA), use DCM Form 9-A instead of DCM Form C-5.

(1)	**PROJECT NUMBER(S):** Insert the DCM (BC) Project Number in the block provided. • On DCM Form 9-A, also insert the PSCA Project Number in the block provided.
(2)	**DATE:** Insert the date upon which the Contractor will sign the contract.
(3)	**OWNER:** Insert the full, legal name, address, email, and telephone number of the Owner (Awarding Authority). • On DCM Form 9-A, insert the name, address, email, and telephone number of the Local Owner (city or county school board, college, university, etc.) after "Alabama Public School and College Authority"
(4)	**CONTRACTOR:** Insert the Contractor's full, legal company name, correct mailing address, email, and telephone number. For State Agency projects, the Contractor Company name and address must match the name and address registered in the State of Alabama Accounting and Resource System (STAARS) used by the State to pay Vendors. The Contractor Company name and address must be consistent across all documents in the same contract package, in order to avoid STAARS rejection. • On DCM Form 9-A: The Contractor Company name and address must match the name and address registered in STAARS used by the State to pay Vendors. The Contractor Company name and address must be consistent across all documents in the same contract package, in order to avoid STAARS rejection.
(5)	**The WORK:** Insert the complete name of the Project; same as in the Bid Documents.
(6)	**CONTRACT DOCUMENTS**: Insert the date of the Bid Documents
(7)	**ADDENDA:** Identify, by number and date, all pre-bid Addenda that were issued to the Bid Documents. If none were issued, insert "None". All Addenda shall be submitted to DCM for review prior to contract issuance.
(8)	**ARCHITECT:** Insert the full, legal name, address, email, and telephone number of the Project Architectural or Engineering firm.
(9)	**CONTRACT SUM:** The Contract Sum is the total of the Contract's Base Bid and accepted Bid Alternate Prices, if any. Insert the Contract Sum in words and figures, verifying that this amount corresponds with the CERTIFIED TABULATION OF BIDS.
(10)	**BID ALTERNATE PRICES**: Identify which, if any, Bid Alternate Prices are accepted and included in the Contract Sum by inserting either (a) "No Alternate Prices Requested in Bid", (b) "No Alternate Prices Accepted", or (c) a listing of the accepted Alternates by number and dollar amount.
(11)	**The CONTRACT TIME:** State the Contract Time in words and in figures.
(12)	**LIQUIDATED DAMAGES:** If the Owner has computed a daily rate for liquidated damages, insert the amount in both words and figures in the spaces provided.
(13)	**SPECIAL PROVISIONS:** This space may be used to incorporate Special Provisions into the Contract, such as unit prices, compliance with enacted provisions, and value engineering. If the solicitation for bids required Unit Prices, insert a statement of which Unit Prices, if any, are accepted and incorporated into the Contract. If more space is needed, Special Provisions may be stated on an attachment that is cited in the Special Provisions section. • DCM Form 9-A is published bearing Special Provision **"A. Severable Payments"**, which is where the portions of the Contract Sum to be paid by the PSCA and the Local Owner are to be stated. Obtain these amounts from Local Owner and insert them in the spaces provided. Other Special Provisions, such as disposition of Unit Prices, may be inserted below this provision.
(14)	**STATE GENERAL CONTRACTOR'S LICENSE:** Insert the Contractor's current state general contracting license number, bid limit, and classification in the spaces provided.

(15)	**SIGNATURES - APPROVING and CONTRACTING PARTIES** Signature spaces vary for different Owner types and funding sources. Download the appropriate document per Owner/funding type from www.dcm.alabama.gov/forms.aspx. Original signatures required; copies of signatures will not be accepted.

PERFORMANCE BOND, DCM Form C-6 or DCM Form 9-B (PSCA Projects), and
PAYMENT BOND, DCM Form C-7 or DCM Form 9-C (PSCA Projects)

Before forwarding the Construction Contract and Bonds to the Owner, verify that the Surety has accurately provided all information in the spaces provided. The information should be the same on both Bonds.

(1)	**SURETY'S BOND NUMBER** should be inserted in the block provided.
(2)	**PRINCIPAL:** Contractor's name and address is to be the same as appears in the Construction Contract.
(3)	**SURETY:** The full, legal name and address of the bonding company.
(4)	**OWNER:** The Owner's name and address is to be the same as appears in the Construction Contract.
(5)	**PENAL SUM:** The Penal Sum of each Bond is to be the Contract Sum of the Construction Contract and is to be inserted in both words and figures.
(6)	The **Date** of the Construction Contract**:** The date that appears on the Construction Contract.
(7)	The **PROJECT:** The same name or description as appears in the Construction Contract.
(8)	**DATE:** After "SIGNED AND SEALED" is to appear the date upon which Contractor and Surety sign the Bond. **THIS DATE CANNOT PRECEDE THE DATE OF THE CONSTRUCTION CONTRACT.**
(9)	**CONTRACTOR'S SIGNATURE:** The Contractor's name must appear beneath "CONTRACTOR", under which the signature of a member or officer of the firm must appear with the name and title of the signing party appearing LEGIBLY beneath the signature.
(10)	**SURETY'S SIGNATURE:** The full, legal name of the bonding company must appear under "SURETY", under which the signature of an individual having power of attorney for the bonding company must appear with the individual's name and title appearing LEGIBLY beneath the signature.
(11)	**ATTACHED POWER OF ATTORNEY:** Clipped to each copy of the Bonds must be a Power of Attorney, signed by an officer of the bonding company, for the individual signing the bond on behalf of the bonding company. **The date of the Power of Attorney** must **not precede the date of the bond.**

ATTACHMENTS

The following documents must be attached to each of the three (3) Construction Contract copies:

- Insurance Certificate (attach copy): It is the responsibility of the design professional to ensure all insurance requirements are discussed with bidders prior to a bid and that Contractor has provided the requirements to their insurance provider. Contractor must obtain all insurance coverage specified in Article 37 of the General Conditions of the Contract - required per Section 39-2-8 of the Code of Alabama.
- Performance Bond: required for contracts of $50,000.0 or more, attach original with surety's power-of-attorney original - required per Section 39-2-8 of the Code of Alabama.
- Payment Bond: required for contracts of $50,000.0 or more, attach original with surety's power-of-attorney original - required per Section 39-2-8 of the Code of Alabama.
- Certified Tabulation of Bids (attach copy): required for all projects including those with informal bids - required per Section 39-2-6 of the Code of Alabama.
- DCM Form C-3: Proposal Form (attach copy): If bid proposal was adjusted by notation on outside of envelope, also attach copy of outside of envelope including notation.
- DCM Form C-3A: Accounting of Sales Tax (attach copy): copy must be of the executed C-3A from the bid - required per Section 40-9-14.1 of the Code of Alabama.
- E-Verify Memorandum of Understanding (attach copy): entire document required - required per Section 31-13-25(b) of the Code of Alabama.
- Alabama Disclosure Statement (attach original) - required per Section 41-16-82 of the Code of Alabama.

FORWARDING CONTRACT and ATTACHMENTS

After determining that the Construction Contract (signed by the Contractor) and attachments are in order, the design professional shall forward all three (3) copies of these documents (with original signatures) to the Owner for signature. The Owner shall then forward the documents per the Review/Signature Flow instructions specified on the contract form underneath the signature block.

SUBMITTAL TO DCM:

- All contract documents and attachments must be single-sided on letter-sized paper without staples; use clips. Purpose: quickly and efficiently scan thousands of documents into DCM's database. Scanners compatible with the database do not scan double-sided nor legal-sized paper.
- Contracts with double-sided printing will not be accepted.
- The Contract Document Administration Fee-CC and the Permit Fee must be paid by the time a Construction Contract for a state agency project, Alabama Community College System (ACCS) project or PSCA-funded project is submitted to DCM for review, or when a fully locally-funded project Construction Contract is converted to PSCA. Contract reviews can begin once the fees have been paid.
- The Permit Fee must be paid by the time a copy of a fully locally-funded K-12 school project's executed Construction Contract is received at DCM's office from the State Department of Education (SDE).

Basic Contract Document Administration (CDA) Fee: This fee covers review of the Agreement Between Owner and Architect (O/A Agreement) and Construction Contract for state agency projects, ACCS projects and partially or fully PSCA-funded projects of K-12 public schools and universities and the related amendments, change orders, service invoices and pay requests. This fee does not apply to fully locally- funded K-12 public school projects or fully locally-funded university projects. The Basic CDA Fee covers review of the original submitted document and one revision. The total basic CDA fee is 1/2 of 1% of the total construction cost, due in two parts: 1/4 of 1% (.25%) of the Project Budget for administration of the O/ A Agreement. 1/4 of 1% (.25%) of the Construction Contract Amount for administration of the Construction Contract.

Additional Revised Contract Document Fee: When more than one revision of a Construction Contract is required, an additional fee of $200.00 will be charged to the design professional for each additional submittal until the document is executed.

Basic Permit Fee: This fee covers required project inspections. The Permit Fee is due when a construction contract or self-performance letter is received by DCM, and must be paid before a Pre-Construction Conference is scheduled with DCM Inspectors for any type of project. Note: although DCM does not review the construction contracts of non-ACCS public higher education institutions such as two and four-year universities, the permit fee must be paid before a required Pre-Construction Conference is scheduled with DCM Inspectors for such projects.

Fees may be paid online at www.dcm.alabama.gov or paid with a physical check. Make check payable to: "Finance - Construction Management", include the DCM (BC) Project #, if assigned, on the check and attach the CDA Fees Calculation Worksheet (also available on www.dcm.alabama.gov). Mail payment to: Finance - Construction Management, P.O. Box 301150, Montgomery, AL 36130-1150. For payments using Public School and College Authority (PSCA) funds and for state agency inter-fund transfers: contact Jennie Jones at 334-242-4808 or jennie.jones@realproperty.alabama.gov.

Numbers in margin correspond to second page of "Checklist", DCM Form B-7

(1) # PERFORMANCE BOND

SURETY'S BOND NUMBER

Do not staple this form; use clips.

(2) The **PRINCIPAL** (*Company name and address of Contractor as appears in the Construction Contract*)
Name:
Address:

(3) The **SURETY** (*Company name and primary place of business*)
Name:
Address:

(4) The **OWNER** (*Entity name and address, same as appears in the Construction Contract*)
Name:
Address:

(5) The **PENAL SUM** of this Bond (the Contract Sum)

Dollars ($).

(6) **DATE** of the Construction Contract :

(7) The **PROJECT**: (*Same as appears in the Construction Contract*)

1. **WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above for the performance of the Contract, and Contract Change Orders, in accord with the requirements of the Contract Documents, which are incorporated herein by reference. If the Contractor performs the Contract, and Contract Change Orders, in accordance with the Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

Numbers in margin correspond to second page of "Checklist", DCM Form B-7

3. Whenever the Architect gives the Contractor and the Surety, at their addresses stated above, a written Notice to Cure a condition for which the Contract may be terminated in accordance with the Contract Documents, the Surety may, within the time stated in the notice, cure or provide the Architect with written verification that satisfactory positive action is in process to cure the condition.

4. The Surety's obligation under this Bond becomes effective after the Contractor fails to satisfy a Notice to Cure and the Owner:

(a) gives the Contractor and the Surety, at their addresses stated above, a written Notice of Termination declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the notice; and

(b) gives the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation under this Bond.

5. In the presence of the conditions described in Paragraph 4, the Surety shall, at its expense:

(a) On the effective date of the Notice of Termination, take charge of the Work and be responsible for the safety, security, and protection of the Work, including materials and equipment stored on and off the Project site, and

(b) Within twenty-one days after the effective date of the Notice of Termination, proceed, or provide the Owner with written verification that satisfactory positive action is in process to facilitate proceeding promptly, to complete the Work in accordance with the Contract Documents, either with the Surety's resources or through a contract between the Surety and a qualified contractor to whom the Owner has no reasonable objection.

6. As conditions precedent to taking charge of and completing the Work pursuant to Paragraph 5, the Surety shall neither require, nor be entitled to, any agreements or conditions other than those of this Bond and the Contract Documents. In taking charge of and completing the Work, the Surety shall assume all rights and obligations of the Contractor under the Contract Documents; however, the Surety shall also have the right to assert "Surety Claims" to the Owner in accordance with the Contract Documents. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to promptly take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

7. By accepting this Bond as a condition of executing the Construction Contract, and by taking the actions described in Paragraph 4, the Owner agrees that:

(a) the Owner shall promptly advise the Surety of the unpaid balance of the Contract Sum and, upon request, shall make available or furnish to the Surety, at the cost of reproduction, any portions of the Project Record, and

(b) as the Surety completes the Work, or has it completed by a qualified contractor, the Owner shall pay the Surety, in accordance with terms of payment of the Contract Documents, the unpaid balance of the Contract Sum, less any amounts that may be or become due the Owner from the Contractor under the Construction Contract or from the Contractor or the Surety under this Bond.

8. In the presence of the conditions described in Paragraph 4, the Surety's obligation includes responsibility for the correction of Defective Work, liquidated damages, and reimbursement of any reasonable expenses incurred by the Owner as a result of the Contractor's default under the Contract, including architectural, engineering, administrative, and legal services.

Numbers in margin correspond to second page of "Checklist", DCM Form B-7

9. Nothing contained in this Bond shall be construed to mean that the Surety shall be liable to the Owner for an amount exceeding the Penal Sum of this Bond, except in the event that the Surety should be in default under the Bond by failing or refusing to take charge of and complete the Work pursuant to Paragraph 5. If the Surety should fail or refuse to take charge of and complete the Work, the Owner shall have the authority to take charge of and complete the Work, or have it completed, and the following costs to the Owner, less the unpaid balance of the Contract Sum, shall be recoverable under this Bond:

(a) the cost of completing the Contractor's responsibilities under the Contract, including correction of Defective Work;

(b) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to completing the Work;

(c) interest on, and the cost of obtaining, funds to supplement the unpaid balance of the Contract Sum as may be necessary to cover the foregoing costs;

(d) the fair market value of any reductions in the scope of the Work necessitated by insufficiency of the unpaid balance of the Contract Sum and available supplemental funds to cover the foregoing costs; and

(f) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to ascertaining and collecting the Owner's losses under the Bond.

10. All claims and disputes arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

(8) **SIGNED AND SEALED** this _____ day of _____, _____.

(9 & 10)

SURETY:	**CONTRACTOR as PRINCIPAL:**
_____ Company Name	_____ Company Name
By _____ Signature	By _____ Signature
_____ Name and Title	_____ Name and Title

(11) NOTE: Original power of attorney for the Surety's signatory shall be furnished with each of the original three bond forms to be attached to each of the three contract copies (with original signatures) per project.

Do not staple this form; use clips. Purpose: quickly and efficiently scan thousands of documents into DCM's database.

Numbers in margin correspond to second page of "Checklist", DCM Form B-7

(1) # PAYMENT BOND

SURETY'S BOND NUMBER

Do not staple this form; use clips.

(2) The **PRINCIPAL** (*Company name and address of Contractor, same as appears in the Construction Contract*)
Name:
Address:

(3) The **SURETY** (*Company name and primary place of business*)
Name:
Address:

(4) The **OWNER(s)** (*Entity name and address, same as appears in the Construction Contract*)
Name:
Address:

(5) The **PENAL SUM** of this Bond (the Contract Sum)

Dollars ($).

(6) **DATE** of the Construction Contract:

(7) The **PROJECT**: (*Same as appears in the Construction Contract*)

1. **WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above to promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract, which is incorporated herein by reference, and any modifications thereof by Contract Change Orders. If the Contractor and its Subcontractors promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders, then this obligation shall be null and void; otherwise to remain and be in full force and effect.

2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

Numbers in margin correspond to second page of "Checklist", DCM Form B-7

3. Any person that has furnished labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders for which payment has not been timely made may institute a civil action upon this Bond and have their rights and claims adjudicated in a civil action and judgment entered thereon. Notwithstanding the foregoing, a civil action may not be instituted on this bond until 45 days after written notice to the Surety of the amount claimed to be due and the nature of the claim. The civil action must commence not later than one year from the date of final settlement of the Contract. The giving of notice by registered or certified mail, postage prepaid, addressed to the Surety at any of its places of business or offices shall be deemed sufficient. In the event the Surety or Contractor fails to pay the claim in full within 45 days from the mailing of the notice, then the person or persons may recover from the Contractor and Surety, in addition to the amount of the claim, a reasonable attorney's fee based on the result, together with interest on the claim from the date of the notice.

4. Every person having a right of action on this bond shall, upon written application to the Owner indicating that labor, material, or supplies for the Work have been supplied and that payment has not been made, be promptly furnished a certified copy of this bond and the Construction Contract. The claimant may bring a civil action in the claimant's name on this Bond against the Contractor and the Surety, or either of them, in the county in which the Work is to be or has been performed or in any other county where venue is otherwise allowed by law.

5. This bond is furnished to comply with Code of Alabama, §39-1-1, and all provisions thereof shall be applicable to civil actions upon this bond.

6. All claims and disputes between Owner and either the Contractor or Surety arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

(8) **SIGNED AND SEALED** this _____ day of _____, _____.

(9 & 10)

SURETY:	**CONTRACTOR as PRINCIPAL:**
_____ Company Name	_____ Company Name
By _____ Signature	By _____ Signature
_____ Name and Title	_____ Name and Title

(11) NOTE: Original power of attorney for the Surety's signatory shall be furnished with each of the original three bond forms to be attached to each of the three contract copies (with original signatures) per project.

Do not staple this form; use clips. Purpose: quickly and efficiently scan thousands of documents into DCM's database.

GENERAL CONDITIONS of the CONTRACT

CONTENTS

ARTICLE 1
DEFINITIONS

Whenever the following terms, or pronouns in place of them, are used in the Contract Documents, the intent and meaning shall be interpreted as follows:

A. ALABAMA DIVISION OF CONSTRUCTION MANAGEMENT: The Technical Staff of the Alabama Division of Construction Management.

B. ARCHITECT: The Architect is the person or entity lawfully licensed to practice architecture in the State of Alabama, who is under contract with the Owner as the primary design professional for the Project and identified as the Architect in the Construction Contract. The term "Architect" means the Architect or the Architect's authorized representative. If the employment of the Architect is terminated, the Owner shall employ a new Architect whose status under the Contract Documents shall be that of the former Architect. If the primary design professional for the Project is a Professional Engineer, the term "Engineer" shall be substituted for the term "Architect" wherever it appears in this document.

C. COMMISSION: The former Alabama Building Commission, for which the Alabama Division of Construction Management has been designated by the Legislature as its successor.

D. CONTRACT: The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:

(1) Construction Contract
(2) Performance and Payment Bonds
(3) Conditions of the Contract (General, Supplemental, and other Conditions)
(4) Specifications
(5) Drawings
(6) Contract Change Orders
(7) Modifications to the Construction Contract (applicable to PSCA Projects)

E. CONTRACT SUM: The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term "Contract Sum" means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.

F. CONTRACT TIME: The Contract Time is the period of time in which the Contractor must achieve Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner or Director. The Date of Substantial Completion is the date established in accordance with Article 32. The term "Contract Time" means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

G. CONTRACTOR: The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity, identified as such in the Construction Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

H. DCM: The Alabama Division of Construction Management.

I. DCM PROJECT INSPECTOR: The member of the Technical Staff of the Alabama Division of Construction Management to whom the Project is assigned relative to executing the respective inspections and authorities described in Article 16, Inspection of the Work.

J. DEFECTIVE WORK: The term "Defective Work" shall apply to: **(1)** any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, **(2)** in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, **(3) s**ubstitutions and deviations not properly submitted and approved or otherwise authorized, **(4)** temporary

supports, structures, or construction which will not produce the results required by the Contract Documents, and **(5)** materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.

K. DIRECTOR: The Director of the Alabama Division of Construction Management.

L. DRAWINGS: The Drawings are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.

M. NOTICE TO PROCEED: A proceed order issued by the Owner or Director, as applicable, fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.

N. OWNER: The Owner is the entity or entities identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative. The term "Owner" as used herein shall be synonymous with the term "Awarding Authority" as defined and used in Title 39 - Public Works, Code of Alabama, 1975, as amended.

O. THE PROJECT: The Project is the total construction of which the Work required by these Contract Documents may be the entirety or only a part with other portions to be constructed by the Owner or separate contractors.

P. PROJECT MANUAL: The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.

Q. SPECIFICATIONS: The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.

R. SUBCONTRACTOR: A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term "Subcontractor" means a Subcontractor or its authorized representatives.

S. THE WORK: The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor's obligations under the Contract. The Work may constitute the entire Project or only a portion of it.

ARTICLE 2
INTENT and INTERPRETATION of the CONTRACT DOCUMENTS

A. INTENT

It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the

Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

B. COMPLEMENTARY DOCUMENTS

The Contract Documents are complementary. If Work is required by one Contract Document, the Contractor shall perform the Work as if it were required by all of the Contract Documents. However, the Contractor shall be required to perform Work only to the extent that is consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

C. ORDER of PRECEDENCE

Should any discrepancy arise between the various elements of the Contract Documents, precedence shall be given to them in the following order unless to do so would contravene the apparent Intent of the Contract Documents stated in preceding Paragraph A:

(1) The Construction Contract.
(2) Addenda, with those of later date having precedence over those of earlier date.
(3) Supplementary Conditions (or other Conditions which modify the General Conditions of the Contract).
(4) General Conditions of the Contract.
(5) The Specifications.
(6) Details appearing on the Drawings; large scale details shall take precedence over smaller scale details.
(7) The Drawings; large scale drawings shall take precedence over smaller scale drawings.

D. ORGANIZATION

Except as may be specifically stated within the technical specifications, neither the organization of the Specifications into divisions, sections, or otherwise, nor any arrangement of the Drawings shall control how the Contractor subcontracts portions of the Work or assigns Work to any trade.

E. INTERPRETATION

(1) The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the Intent of the Contract Documents stated in preceding Paragraph A. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as "Not In Contract" ("N.I.C."), the Contractor's obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor's expense to produce a product or system that is complete, appropriately tested, and in operative condition ready for use or subsequent construction or operation of the Owner or separate contractors. The omission of words or phases for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

(2) Words or phrases used in the Contract Documents which have well-known technical or

construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

(3) Except as noted otherwise, references to standard specifications or publications of associations, bureaus, or organizations shall mean the latest edition of the referenced standard specification or publication as of the date of the Advertisement for Bids.

(4) In the case of inconsistency between Drawings and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

(5) Any portions of the Contract Documents written in longhand must be initialed by all parties..

(6) Any doubt as to the meaning of the Contract Documents or any obscurity as to the wording of them, shall be promptly submitted in writing to the Architect for written interpretation, explanation, or clarification.

F. SEVERABILITY.

The partial or complete invalidity of any one or more provision of this Contract shall not affect the validity or continuing force and effect of any other provision.

ARTICLE 3
CONTRACTOR'S REPRESENTATIONS

By executing the Construction Contract the Contractor represents to the Owner:

A. The Contractor has visited the site of the Work to become familiar with local conditions under which the Work is to be performed and to evaluate reasonably observable conditions as compared with requirements of the Contract Documents.

B. The Contractor shall use its best skill and attention to perform the Work in an expeditious manner consistent with the Contract Documents.

C. The Contractor is an independent contractor and in performance of the Contract remains and shall act as an independent contractor having no authority to represent or obligate the Owner in any manner unless authorized by the Owner in writing.

ARTICLE 4
DOCUMENTS FURNISHED to CONTRACTOR

Unless otherwise provided in the Contract Documents, twenty sets of Drawings and Project Manuals will be furnished to the Contractor by the Architect without charge. Other copies requested will be furnished at reproduction cost.

ARTICLE 5
OWNERSHIP of DRAWINGS

All original or duplicated Drawings, Specifications, and other documents prepared by the Architect, and furnished to the Contractor are the property of the Architect and are to be used solely for this Project and not to be used in any manner for other work. Upon completion of the Work, all copies of Drawings and Specifications, with the exception of the Contractor's record set, shall be returned or accounted for by the Contractor to the Architect, on request.

ARTICLE 6
SUPERVISION, SUPERINTENDENT, and EMPLOYEES

A. SUPERVISION and CONSTRUCTION METHODS

(1) The term "Construction Methods" means the construction means, methods, techniques, sequences, and procedures utilized by the Contractor in performing the Work. The Contractor is solely responsible for supervising and coordinating the performance of the Work, including the selection of Construction Methods, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Contractor is solely and completely responsible for job site safety, including the protection of persons and property in accordance with Article 14.

(3) The Contractor shall be responsible to the Owner for acts and omissions of not only the Contractor and its agents and employees, but all persons and entities, and their agents and employees, who are performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

(4) The Contractor shall be responsible to inspect the in-progress and completed Work to verify its compliance with the Contract Documents and to insure that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work.

B. SUPERINTENDENT

(1) The Contractor shall employ and maintain a competent level of supervision for the performance of the Work at the Project site, including a superintendent who shall:

(a) have full authority to receive instructions from the Architect or Owner and to act on those instructions and **(b)** be present at the Project site at all times during which Work is being performed.

(2) Before beginning performance of the Work, the Contractor shall notify the Architect in writing of the name and qualifications of its proposed superintendent so that the Owner may review the individual's qualifications. If, for reasonable cause, the Owner refuses to approve the individual, or withdraws its approval after once giving it, the Contractor shall name a different superintendent for the Owner's review and approval. Any disapproved superintendent will not perform in that capacity thereafter at the Project site.

C. EMPLOYEES

The Contractor shall permit only fit and skilled persons to perform the Work. The Contractor shall enforce safety procedures, strict discipline, and good order among persons performing the Work. The Contractor will remove from its employment on the Project any person who deliberately or persistently produces non-conforming Work or who fails or refuses to conform to reasonable rules of personal conduct contained in the Contract Documents or implemented by the Owner and delivered to the Contractor in writing during the course of the Work.

ARTICLE 7
REVIEW of CONTRACT DOCUMENTS and FIELD CONDITIONS by CONTRACTOR

A. In order to facilitate assembly and installation of the Work in accordance with the Contract Documents, before starting each portion of the Work, the Contractor shall examine and compare the relevant Contract Documents, and compare them to relevant field measurements made by the Contractor and any conditions at the site affecting that portion of the Work.

B. If the Contractor discovers any errors, omissions, or inconsistencies in the Contract Documents, the Contractor shall promptly report them to the Architect as a written request for information that includes a detailed statement identifying the specific Drawings or Specifications that are in need of clarification and the error, omission, or inconsistency discovered in them.

(1) The Contractor shall not be expected to act as a licensed design professional and ascertain whether the Contract Documents comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, but the Contractor shall be obligated to promptly notify the Architect of any such noncompliance discovered by or made known to the Contractor. If the Contractor performs Work without fulfilling this notification obligation, the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

(2) The Contractor shall not be liable to the Owner for errors, omissions, or inconsistencies that may exist in the Contract Documents, or between the Contract Documents and conditions at the site, unless the Contractor knowingly fails to report a discovered error, omission, or inconsistency to the Architect, in which case the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

C. If the Contractor considers the Architect's response to a request for information to constitute a change to the Contract Documents involving additional costs and/or time, the Contractor shall follow the procedures of Article 20, Claims for Extra Cost or Extra Work.

D. If, with undue frequency, the Contractor requests information that is obtainable through reasonable examination and comparison of the Contract Documents, site conditions, and previous correspondence, interpretations, or clarifications, the Contractor shall be liable to the Owner for reasonable charges from the Architect for the additional services required to review, research, and respond to such requests for information.

ARTICLE 8
SURVEYS by CONTRACTOR

A. The Contractor shall provide competent engineering services to assure accurate execution of the Work in accordance with the Contract Documents. The Contractor shall verify the figures given for the contours, approaches and locations shown on the Drawings before starting any Work and be responsible for the accuracy of the finished Work. Without extra cost to the Owner, the Contractor shall engage a licensed surveyor if necessary to verify boundary lines, keep within property lines, and shall be responsible for encroachments on rights or property of public or surrounding property owners.

B. The Contractor shall establish all base lines for the location of the principal components of the Work and make all detail surveys necessary for construction, including grade stakes, batter boards and other working points, lines and elevations. If the Work involves alteration of or addition to existing structures or improvements, the Contractor shall locate and measure elements of the existing conditions as is necessary to facilitate accurate fabrication, assembly, and installation of new Work in the relationship, alignment, and/or connection to the existing structure or improvement as is shown in the Contract Documents.

ARTICLE 9
SUBMITTALS

A. Where required by the Contract Documents, the Contractor shall submit shop drawings, product data, samples and other information (hereinafter referred to as Submittals) to the Architect for the purpose of demonstrating the way by which the Contractor proposes to conform to the requirements of the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.

B. The Contractor shall be responsible to the Owner for the accuracy of its Submittals and the conformity of its submitted information to the requirements of the Contract Documents. Each Submittal shall bear the Contractor's approval, evidencing that the Contractor has reviewed and found the information to be in compliance with the requirements of the Contract Documents. Submittals which are not marked as reviewed and approved by the Contractor may be returned by the Architect without action.

C. The Contractor shall prepare and deliver its submittals to the Architect sufficiently in advance of construction requirements and in a sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. In coordinating the Submittal process with its construction schedule, the Contractor shall allow sufficient time to permit adequate review by the Architect.

D. By approving a Submittal the Contractor represents not only that the element of Work presented in the Submittal complies with the requirements of the Contract Documents, but also that the Contractor has:

(1) found the layout and/or dimensions in the Submittal to be comparable with those in the Contract Documents and other relevant Submittals and has made field measurements as necessary to verify their accuracy, and
(2) determined that products, materials, systems, equipment and/or procedures presented in the Submittal are compatible with those presented, or being presented, in other relevant Submittals and

with the Contractor's intended Construction Methods.

E. The Contractor shall not fabricate or perform any portion of the Work for which the Contract Documents require Submittals until the respective Submittals have been approved by the Architect.

F. In the case of a resubmission, the Contractor shall direct specific attention to all revisions in a Submittal. The Architect's approval of a resubmission shall not apply to any revisions that were not brought to the Architect's attention.

G. If the Contract Documents specify that a Submittal is to be prepared and sealed by a registered architect or licensed engineer retained by the Contractor, all drawings, calculations, specifications, and certifications of the Submittal shall bear the Alabama seal of registration and signature of the registered/licensed design professional who prepared them or under whose supervision they were prepared. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of such a Submittal, provided that all performance and design criteria that such Submittal must satisfy are sufficiently specified in the Contract Documents. The Architect will review, approve or take other appropriate action on such a Submittal only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria specified in the Contract Documents.

H. DEVIATIONS

(1) The Architect is authorized by the Owner to approve "minor" deviations from the requirements of the Contract Documents. "Minor" deviations are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Deviations which are not "minor" may be authorized only by the Owner through the Change Order procedures of Article 19.

(2) Any deviation from the requirements of the Contract Documents contained in a Submittal shall be clearly identified as a "Deviation from Contract Requirements" (or by similar language) within the Submittal and, in a letter transmitting the Submittal to the Architect, the Contractor shall direct the Architect's attention to, and request specific approval of, the deviation. Otherwise, the Architect's approval of a Submittal does not constitute approval of deviations from the requirements of the Contract Documents contained in the Submittal.

(3) The Contractor shall bear all costs and expenses of any changes to the Work, changes to work performed by the Owner or separate contractors, or additional services by the Architect required to accommodate an approved deviation unless the Contractor has specifically informed the Architect in writing of the required changes and a Change Order has been issued authorizing the deviation and accounting for such resulting changes and costs.

I. ARCHITECT'S REVIEW and APPROVAL

(1) The Architect will review the Contractor's Submittals for conformance with requirements of, and the design concept expressed in, the Contract Documents and will approve or take other appropriate action upon them. This review is not intended to verify the accuracy and completeness of details such as dimensions and quantities nor to substantiate installation instructions or performance of equipment or systems, all of which remain the responsibility of the Contractor. However, the Architect shall advise the Contractor of any errors or omissions which the Architect

may detect during this review. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

(2) The Architect will review and respond to all Submittals with reasonable promptness to avoid delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time to permit adequate review.

(3) No corrections or changes to Submittals indicated by the Architect will be considered as authorizations to perform Extra Work. If the Contractor considers such correction or change of a Submittal to require Work which differs from the requirements of the Contract Documents, the Contractor shall promptly notify the Architect in writing in accordance with Article 20, Claims for Extra Cost or Extra Work.

J. CONFORMANCE with SUBMITTALS

The Work shall be constructed in accordance with approved Submittals.

ARTICLE 10
DOCUMENTS and SAMPLES at the SITE

A. "AS ISSUED" SET

The Contractor shall maintain at the Project site, in good order, at least one copy of all Addenda, Change Orders, supplemental drawings, written directives and clarifications, and approved Submittals intact as issued, and an updated construction schedule.

B. "POSTED" SET

The Contractor shall maintain at the Project site, in good order, at least one set of the Drawings and Project Manual into which the Contractor has "posted"(incorporated) all Addenda, Change Orders, supplemental drawings, clarifications, and other information pertinent to the proper performance of the Work. The Contractor shall assure that all sets of the Drawings and Project Manuals being used by the Contractor, Subcontractors, and suppliers are "posted" with the current information to insure that updated Contract Documents are used for performance of the Work.

C. RECORD SET

One set of the Drawings and Project Manual described in Paragraph B shall be the Contractor's record set in which the Contractor shall record all field changes, corrections, selections, final locations, and other information as will be duplicated on the "As-built" documents required under Article 11. The Contractor shall record such "as-built" information in its record set as it becomes available through progress of the Work. The Contractor's performance of this requirement shall be subject to confirmation by the Architect at any time as a prerequisite to approval of Progress Payments.

D. The documents and samples required by this Article to be maintained at the Project site shall be readily available to the Architect, Owner, DCM Project Inspector, and their representatives.

ARTICLE 11
"AS-BUILT" DOCUMENTS

A. Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets of "As-built" documents, as described herein, to the Architect for submission to the Owner upon completion of the Work. Each set of "As-built' documents shall consist of a copy of the Drawings and Project Manual, in like-new condition, into which the Contractor has neatly incorporated all Addenda, Change Orders, supplemental drawings, clarifications, field changes, corrections, selections, actual locations of underground utilities, and other information as required herein or specified elsewhere in the Contract Documents.

B. The Contractor shall use the following methods for incorporating information into the "As-built" documents:

(1) Drawings

(a) To the greatest extent practicable, information shall be carefully drawn and lettered, in ink, on the Drawings in the form of sketches, details, plans, notes, and dimensions as required to provide a fully dimensioned record of the Work. When required for clarity, sketches, details, or partial plans shall be drawn on supplemental sheets and bound into the Drawings and referenced on the drawing being revised.

(b) Where a revised drawing has been furnished by the Architect, the drawing of latest date shall be bound into the Drawings in the place of the superseded drawing.

(c) Where a supplemental drawing has been furnished by the Architect, the supplemental drawing shall be bound into the Drawings in an appropriate location and referred to by notes added to the drawing being supplemented.

(d) Where the Architect has furnished details, partial plans, or lengthy notes of which it would be impractical for the Contractor to redraw or letter on a drawing, such information may be affixed to the appropriate drawing with transparent tape if space is available on the drawing.

(e) Any entry of information made in the Drawings that is the result of an Addendum or Change Order, shall identify the Addendum or Change Order from which it originated.

(2) Project Manual

(a) A copy of all Addenda and Change Orders, excluding drawings thereof, shall be bound in the front of the Project Manual.

(b) Where a document, form, or entire specification section is revised, the latest issue shall be bound into the Project Manual in the place of the superseded issue.

(c) Where information within a specification section is revised, the deleted or revised information shall be drawn through in ink and an adjacent note added identifying the Addendum or Change Order containing the revised information.

C. Within ten days after the Date of Substantial Completion of the Work, or the last completed portion of the Work, the Contractor shall submit the "As-built" documents to the Architect for approval. If the Architect requires that any corrections be made, the documents will be returned in a reasonable time for correction and resubmission.

ARTICLE 12
PROGRESS SCHEDULE

(Not applicable if the Contract Time is 60 days or less.)

A. The Contractor shall within fifteen days after the date of commencement stated in the Notice to Proceed, or such other time as may be provided in the Contract Documents, prepare and submit to the Architect for review and approval a practicable construction schedule informing the Architect and Owner of the order in which the Contractor plans to carry on the Work within the Contract Time. The Architect's review and approval of the Contractor's construction schedule shall be only for compliance with the specified format, Contract Time, and suitability for monitoring progress of the Work and shall not be construed as a representation that the Architect has analyzed the schedule to form opinions of sequences or durations of time represented in the schedule.

B. If a schedule format is not specified elsewhere in the Contract Documents, the construction schedule shall be prepared using DCM Form C-11, "Sample Progress Schedule and Report", (contained in the Project Manual) or similar format of suitable scale and detail to indicate the percentage of Work scheduled to be completed at the end of each month. At the end of each month the Contractor shall enter the actual percentage of completion on the construction schedule submit two copies to the Architect, and attach one copy to each copy of the monthly Application for Payment. The construction schedule shall be revised to reflect any agreed extensions of the Contract Time or as required by conditions of the Work.

C. If a more comprehensive schedule format is specified elsewhere in the Contract Documents or voluntarily employed by the Contractor, it may be used in lieu of DCM Form C-11.

D. The Contractor's construction schedule shall be used by the Contractor, Architect, and Owner to determine the adequacy of the Contractor's progress. The Contractor shall be responsible for maintaining progress in accordance with the currently approved construction schedule and shall increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant and equipment as may be necessary to do so. If the Contractor's progress falls materially behind the currently approved construction schedule and, in the opinion of the Architect or Owner, the Contractor is not taking sufficient steps to regain schedule, the Architect may, with the Owner's concurrence, issue the Contractor a Notice to Cure pursuant to Article 27. In such a Notice to Cure the Architect may require the Contractor to submit such supplementary or revised construction schedules as may be deemed necessary to demonstrate the manner in which schedule will be regained.

ARTICLE 13
EQUIPMENT, MATERIALS, and SUBSTITUTIONS

A. Every part of the Work shall be executed in a workmanlike manner in accordance with the Contract Documents and approved Submittals. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise.

B. Whenever a product, material, system, item of equipment, or service is identified in the Contract Documents by reference to a trade name, manufacturer's name, model number, etc.(hereinafter

referred to as "source"), and only one or two sources are listed, or three or more sources are listed and followed by "or approved equal" or similar wording, it is intended to establish a required standard of performance, design, and quality, and the Contractor may submit, for the Architect's approval, products, materials, systems, equipment, or services of other sources which the Contractor can prove to the Architect's satisfaction are equal to, or exceed, the standard of performance, design and quality specified, unless the provisions of Paragraph D below apply. Such proposed substitutions are not to be purchased or installed without the Architect's written approval of the substitution.

C. If the Contract Documents identify three or more sources for a product, material, system, item of equipment or service to be used and the list of sources is not followed by "or approved equal" or similar wording, the Contractor may make substitution only after evaluation by the Architect and execution of an appropriate Contract Change Order.

D. If the Contract Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the Contractor must furnish the identified sole source.

ARTICLE 14
SAFETY and PROTECTION of PERSONS and PROPERTY

A. The Contractor shall be solely and completely responsible for conditions at the Project site, including safety of all persons (including employees) and property. The Contractor shall create, maintain, and supervise conditions and programs to facilitate and promote safe execution of the Work, and shall supervise the Work with the attention and skill required to assure its safe performance. Safety provisions shall conform to OSHA requirements and all other federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. Nothing contained in this Contract shall be construed to mean that the Owner has employed the Architect nor has the Architect employed its consultants to administer, supervise, inspect, or take action regarding safety programs or conditions at the Project site.

B. The Contractor shall employ Construction Methods, safety precautions, and protective measures that will reasonably prevent damage, injury or loss to:

(1) workers and other persons on the Project site and in adjacent and other areas that may be affected by the Contractor's operations;

(2) the Work and materials and equipment to be incorporated into the Work and stored by the Contractor on or off the Project site; and

(3) other property on, or adjacent to, the Project site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and other improvements not designated in the Contract Documents to be removed, relocated, or replaced.

C. The Contractor shall be responsible for the prompt remedy of damage and loss to property, including the filing of appropriate insurance claims, caused in whole or in part by the fault or negligence of the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

D. The Contractor shall comply with and give notices required by applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety and protection of persons or property, including without limitation notices to adjoining property owners of excavation or other construction activities that potentially could cause damage or injury to adjoining property or persons thereon.

E. The Contractor shall erect and maintain barriers, danger signs, and any other reasonable safeguards and warnings against hazards as may be required for safety and protection during performance of the Contract and shall notify owners and users of adjacent sites and utilities of conditions that may exist or arise which may jeopardize their safety.

F. If use or storage of explosives or other hazardous materials or equipment or unusual Construction Methods are necessary for execution of the Work, the Contractor shall exercise commensurate care and employ supervisors and workers properly qualified to perform such activity.

G. The Contractor shall furnish a qualified safety representative at the Project site whose duties shall include the prevention of accidents. The safety representative shall be the Contractor's superintendent, unless the Contractor assigns this duty to another responsible member of its on-site staff and notifies the Owner and Architect in writing of such assignment.

H. The Contractor shall not permit a load to be applied, or forces introduced, to any part of the construction or site that may cause damage to the construction or site or endanger safety of the construction, site, or persons on or near the site.

I. The Contractor shall have the right to act as it deems appropriate in emergency situations jeopardizing life or property. The Contractor shall be entitled to equitable adjustment of the Contract Sum or Contract Time for its efforts expended for the sole benefit of the Owner in an emergency. Such adjustment shall be determined as provided in Articles 19 and 20.

J. The duty of the Architect and the Architect's consultants to visit the Project site to conduct periodic inspections of the Work or for other purposes shall not give rise to a duty to review or approve the adequacy of the Contractor's safety program, safety supervisor, or any safety measure which Contractor takes or fails to take in, on, or near the Project site.

ARTICLE 15
HAZARDOUS MATERIALS

A. A Hazardous Material is any substance or material identified as hazardous under any federal, state, or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing its handling, disposal, and/or clean-up. Existing Hazardous Materials are Hazardous Materials discovered at the Project site and not introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

B. If, during the performance of the Work, the Contractor encounters a suspected Existing Hazardous Material, the Contractor shall immediately stop work in the affected area, take measures appropriate to the condition to keep people away from the suspected Existing Hazardous Material, and

immediately notify the Architect and Owner of the condition in writing.

C. The Owner shall obtain the services of an independent laboratory or professional consultant, appropriately licensed and qualified, to determine whether the suspected material is a Hazardous Material requiring abatement and, if so, to certify after its abatement that it has been rendered harmless. Any abatement of Existing Hazardous Materials will be the responsibility of the Owner. The Owner will advise the Contractor in writing of the persons or entities who will determine the nature of the suspected material and those who will, if necessary, perform the abatement. The Owner will not employ persons or entities to perform these services to whom the Contractor or Architect has reasonable objection.

D. After certification by the Owner's independent laboratory or professional consultant that the material is harmless or has been rendered harmless, work in the affected area shall resume upon written agreement between the Owner and Contractor. If the material is found to be an Existing Hazardous Material and the Contractor incurs additional cost or delay due to the presence and abatement of the material, the Contract Sum and/or Contract Time shall be appropriately adjusted by a Contract Change Order pursuant to Article 19.

E. The Owner shall not be responsible for Hazardous Materials introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable unless such Hazardous Materials were required by the Contract Documents.

ARTICLE 16
INSPECTION of the WORK

A. GENERAL

(1) The Contractor is solely responsible for the Work's compliance with the Contract Documents; therefore, the Contractor shall be responsible to inspect in-progress and completed Work, and shall verify its compliance with the Contract Documents and that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work. Neither the presence nor absence of inspections by the Architect, Owner, Director, DCM Project Inspector, any public authority having jurisdiction, or their representatives shall relieve the Contractor of responsibility to inspect the Work, for responsibility for Construction Methods and safety precautions and programs in connection with the Work, or from any other requirement of the Contract Documents.

(2) The Architect, Owner, Director, DCM Project Inspector, any public authority having jurisdiction, and their representatives shall have access at all times to the Work for inspection whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection. All materials, workmanship, processes of manufacture, and methods of construction, if not otherwise stipulated in the Contract Documents, shall be subject to inspection, examination, and test at any and all places where such manufacture and/or construction are being carried on. Such inspections will not unreasonably interfere with the Contractor's operations.

(3) The Architect will inspect the Work as a representative of the Owner. The Architect's inspections may be supplemented by inspections by the DCM Project Inspector as a representative of the Alabama Division of Construction Management.

(4) The Contractor may be charged by the Owner for any extra cost of inspection incurred by the Owner or Architect on account of material and workmanship not being ready at the time of inspection set by the Contractor.

B. TYPES of INSPECTIONS

(1) SCHEDULED INSPECTIONS and CONFERENCES. Scheduled Inspections and Conferences are conducted by the Architect, scheduled by the Architect in coordination with the Contractor and DCM Project Inspector, and are attended by the Contractor and applicable Subcontractors, suppliers and manufacturers, and the DCM Project Inspector. Scheduled Inspections and Conferences of this Contract include:

(a) Pre-construction Conference.

(b) Pre-roofing Conference (not applicable if the Contract involves no roofing work)

(**c) Above Ceiling Inspection(s)**: An above ceiling inspection of all spaces in the building is required before the ceiling material is installed. Above ceiling inspections are to be conducted at a time when all above ceiling systems are complete and tested to the greatest extent reasonable pending installation of the ceiling material. System identifications and markings are to be complete. All fire-rated construction including fire-stopping of penetrations and specified identification above the ceiling shall be complete. Ceiling framing and suspension systems shall be complete with lights, grilles and diffusers, access panels, fire protection drops for sprinkler heads, etc., installed in their final locations to the greatest extent reasonable. Above ceiling framing to support ceiling mounted equipment shall be complete. The above ceiling construction shall be complete to the extent that after the inspection the ceiling material can be installed without disturbance.

(**d) Final Inspection(s):** A Final Inspection shall establish that the Work, or a designated portion of the Work, is Substantially Complete in accordance with Article 32 and is accepted by the Architect, Owner, and DCM Project Inspector as being ready for the Owner's occupancy or use. At the conclusion of this inspection, items requiring correction or completion ("punch list" items) shall be minimal and require only a short period of time for accomplishment to establish Final Acceptance of the Work. If the Work, or designated portion of the Work, includes the installation, or modification, of a fire alarm system or other life safety systems essential to occupancy, such systems shall have been tested and appropriately certified before the Final Inspection.

(**e) Year-end Inspection(s):** An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one year warranty period(s). The subsequent delivery of the Architect's report of this inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period in accordance with Article 35.

(2) PERIODIC INSPECTIONS. Periodic Inspections are conducted throughout the course of the Work by the Architect, the Architect's consultants, their representatives, and the DCM Project Inspector, jointly or independently, with or without advance notice to the Contractor.

(3) SPECIFIED INSPECTIONS and TESTS. Specified Inspections and Tests include inspections, tests, demonstrations, and approvals that are either specified in the Contract Documents or required by laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction, to be performed by the Contractor, one of its Subcontractors, or an independent testing laboratory or firm (whether paid for by the Contractor or Owner).

C. INSPECTIONS by the ARCHITECT

(1) The Architect is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations as defined in Article 9 and "minor" changes as defined in Article 19), to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner.

(2) The Architect will visit the site at intervals appropriate to the stage of the Contractor's operations and as otherwise necessary to:

(a) become generally familiar with the in-progress and completed Work and the quality of the Work,

(b) determine whether the Work is progressing in general accordance with the Contractor's schedule and is likely to be completed within the Contract Time,

(c) visually compare readily accessible elements of the Work to the requirements of the Contract Documents to determine, in general, if the Contractor's performance of the Work indicates that the Work will conform to the requirements of the Contract Documents when completed,

(d) endeavor to guard the Owner against Defective Work,

(e) review and address with the Contractor any problems in implementing the requirements of the Contract Documents that the Contractor may have encountered, and

(f) keep the Owner fully informed about the Project.

(3) The Architect shall have the authority to reject Defective Work or require its correction, but shall not be required to make exhaustive investigations or examinations of the in-progress or completed portions of the Work to expose the presence of Defective Work. However, it shall be an obligation of the Architect to report in writing, to the Owner, Contractor, and DCM Project Inspector, any Defective Work recognized by the Architect.

(4) The Architect shall have the authority to require the Contractor to stop work only when, in the Architect's reasonable opinion, such stoppage is necessary to avoid Defective Work. The Architect shall not be liable to the Contractor or Owner for the consequences of any decisions made by the Architect in good faith either to exercise or not to exercise this authority.

(5) "Inspections by the Architect" includes appropriate inspections by the Architect's consultants as dictated by their respective disciplines of design and the stage of the Contractor's operations.

D. INSPECTIONS by the DCM PROJECT INSPECTOR

(1) The DCM Project Inspector will:

(a) participate in scheduled inspections and conferences as practicable,

(b) perform periodic inspections of in-progress and completed Work to ensure code compliance of the Project and general conformance of the Work with the Contract Documents, and

(c) monitor the Contractor's progress and performance of the Work.

(2) The DCM Project Inspector shall have the authority to:

(a) reject Work that is not in compliance with the State Building Code adopted by the DCM, unless the Work is in accordance with the Contract Documents in which case the DCM Project Inspector will advise the Architect to initiate appropriate corrective action, and

(b) notify the Architect, Owner, and Contractor of Defective Work recognized by the DCM Project Inspector.

(3) The DCM Project Inspector's periodic inspections will usually be scheduled around key stages of construction based upon information reported by the Architect. As the Architect or Owner deems appropriate, the DCM Project Inspector, as well as other members of the Technical Staff, can be requested to schedule special inspections or meetings to address specific matters. The written findings of DCM Project Inspector will be transmitted to the Owner, Contractor, and Architect.

(4) The DCM Project Inspector is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents, to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner. The Contractor shall not proceed with Work as a result of instructions or findings of the DCM Project Inspector which the Contractor considers to be a change to the requirements of the Contract Documents without written authorization of the Owner through the Architect.

E. UNCOVERING WORK

(1) If the Contractor covers a portion of the Work before it is examined by the Architect and this is contrary to the Architect's request or specific requirements in the Contract Documents, then, upon written request of the Architect, the Work must be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

(2) Without a prior request or specific requirement that Work be examined by the Architect before it is covered, the Architect may request that Work be uncovered for examination and the Contractor shall uncover it. If the Work is in accordance with the Contract Documents, the Contract Sum shall be equitably adjusted under Article 19 to compensate the Contractor for the costs of uncovering and replacement. If the Work is not in accordance with the Contract Documents, uncovering, correction, and replacement shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

F. SPECIFIED INSPECTIONS and TESTS

(1) The Contractor shall schedule and coordinate Specified Inspections and Tests to be made at appropriate times so as not to delay the progress of the Work or the work of the Owner or separate contractors. If the Contract Documents require that a Specified Inspection or Test be witnessed or attended by the Architect or Architect's consultant, the Contractor shall give the Architect timely notice of the time and place of the Specified Inspection or Test. If a Specified Inspection or Test reveals that Work is not in compliance with requirements of the Contract Documents, the Contractor shall bear the costs of correction, repeating the Specified Inspection or Test, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services. Through appropriate Contract Change Order the Owner shall bear costs of tests, inspections or approvals which become Contract requirements subsequent to the receipt of bids.

(2) If the Architect, Owner, or public authority having jurisdiction determines that inspections, tests, demonstrations, or approvals in addition to Specified Inspections and Tests are required, the Contractor shall, upon written instruction from the Architect, arrange for their performance by an entity acceptable to the Owner, giving timely notice to the architect of the time and place of their performance. Related costs shall be borne by the Owner unless the procedures reveal that Work is

not in compliance with requirements of the Contract Documents, in which case the Contractor shall bear the costs of correction, repeating the procedures, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services.

(3) Unless otherwise required by the Contract Documents, required certificates of Specified Inspections and Tests shall be secured by the Contractor and promptly delivered to the Architect.

(4) Failure of any materials to pass Specified Inspections and Tests will be sufficient cause for refusal to consider any further samples of the same brand or make of that material for use in the Work.

ARTICLE 17
CORRECTION of DEFECTIVE WORK

A. The Contractor shall, at the Contractor's expense, promptly correct Defective Work rejected by the Architect or which otherwise becomes known to the Contractor, removing the rejected or nonconforming materials and construction from the project site.

B. Correction of Defective Work shall be performed in such a timely manner as will avoid delay of completion, use, or occupancy of the Work and the work of the Owner and separate contractors.

C. The Contractor shall bear all expenses related to the correction of Defective Work, including but not limited to: **(1)** additional testing and inspections, including repeating Specified Inspections and Tests**, (2)** reasonable services and expenses of the Architect, and **(3)** the expense of making good all work of the Contractor, Owner, or separate contractors destroyed or damaged by the correction of Defective Work.

ARTICLE 18
DEDUCTIONS for UNCORRECTED WORK

If the Owner deems it advisable and in the Owner's interest to accept Defective Work, the Owner may allow part or all of such Work to remain in place, provided an equitable deduction from the Contract Sum, acceptable to the Owner, is offered by the Contractor.

ARTICLE 19
CHANGES in the WORK

A. GENERAL

(1) The Owner may at any time direct the Contractor to make changes in the Work which are within the general scope of the Contract, including changes in the Drawings, Specifications, or other portions of the Contract Documents to add, delete, or otherwise revise portions of the Work. The Architect is authorized by the Owner to direct "minor" changes in the Work by written order to the Contractor. "Minor" changes in the Work are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Changes in the Work which are not "minor" may be

authorized only by the Owner.

(2) If the Owner directs a change in the Work, the change shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract, stating their agreement upon the change or changes in the Work and the adjustments, if any, in the Contract Sum and the Contract Time.

(3) Subject to compliance with Alabama's Public Works Law, the Owner may, upon agreement by the Contractor, incorporate previously unawarded bid alternates into the Contract.

(4) In the event of a claim or dispute as to the appropriate adjustment to the Contract Sum or Contract Time due to a directive to make changes in the Work, the Work shall proceed as provided in this article subject to subsequent agreement of the parties or final resolution of the dispute pursuant to Article 24.

(5) Consent of surety will be obtained for all Contract Change Orders involving an increase in the Contract Sum.

(6) Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly to perform changes in the Work, unless otherwise directed by the Owner through the Architect.

(7) All change orders require DCM Form C-12: Contract Change Order and DCM Form B-11: Change Order Justification. Only Change Orders 10% or greater of the current contract amount require the Owner's legal advisor's signature on DCM Form B-11: Change Order Justification.

B. DETERMINATION of ADJUSTMENT of the CONTRACT SUM

The adjustment of the Contract Sum resulting from a change in the Work shall be determined by one of the following methods, or a combination thereof, as selected by the Owner:

(1) Lump Sum. By mutual agreement to a lump sum based on or negotiated from an itemized cost proposal from the Contractor. Additions to the Contract Sum shall include the Contractor's direct costs plus a maximum 15% markup for overhead and profit. Where subcontract work is involved the total mark-up for the Contractor and a Subcontractor shall not exceed 25%. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

(2) Unit Price. By application of Unit Prices included in the Contract or subsequently agreed to by the parties. However, if the character or quantity originally contemplated is materially changed so that application of such unit price to quantities of Work proposed will cause substantial inequity to either party, the applicable unit price shall be equitably adjusted.

(3) Force Account. By directing the Contractor to proceed with the change in the Work on a "force account" basis under which the Contractor shall be reimbursed for reasonable expenditures incurred by the Contractor and its Subcontractors in performing added Work and the Owner shall

receive reasonable credit for any deleted Work. The Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting of the cost of the change together with sufficient supporting data. Unless otherwise stated in the directive, the adjustment of the Contract Sum shall be limited to the following:

(a) costs of labor and supervision, including employee benefits, social security, retirement, unemployment and workers' compensation insurance required by law, agreement, or under Contractor's or Subcontractor's standard personnel policy;

(b) cost of materials, supplies and equipment, including cost of delivery, whether incorporated or consumed;

(c) rental cost of machinery and equipment, not to exceed prevailing local rates if contractor-owned;

(d) costs of premiums for insurance required by the Contract Documents, permit fees, and sales, use or similar taxes related to the change in the Work;

(e) reasonable credits to the Owner for the value of deleted Work, without Contractor or Subcontractor mark-ups; and

(f) for additions to the Contract Sum, mark-up of the Contractor's direct costs for overhead and profit not exceeding 15% on Contractor's work nor exceeding 25% for Contractor and Subcontractor on a Subcontractor's work. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of insurance other than mentioned above, bonds, superintendent and other job office personnel, watchman, use and rental of small tools, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

C. ADJUSTMENT of the CONTRACT TIME due to CHANGES

(1) Unless otherwise provided in the Contract Documents, the Contract Time shall be equitably adjusted for the performance of a change provided that the Contractor notifies the Architect in writing that the change will increase the time required to complete the Work. Such notice shall be provided no later than:

(a) with the Contractor's cost proposal stating the number of days of extension requested, or

(b) within ten days after the Contractor receives a directive to proceed with a change in advance of submitting a cost proposal, in which case the notice should provide an estimated number of days of extension to be requested, which may be subject to adjustment in the cost proposal.

(2) The Contract Time shall be extended only to the extent that the change affects the time required to complete the entire Work of the Contract, taking into account the concurrent performance of the changed and unchanged Work.

D. CHANGE ORDER PROCEDURES

(1) If the Owner proposes to make a change in the Work, the Architect will request that the Contractor provide a cost proposal for making the change to the Work. The request shall be in writing and shall adequately describe the proposed change using drawings, specifications, narrative, or a combination thereof. Within 21 days after receiving such a request, or such other time as may be stated in the request, the Contractor shall prepare and submit to the Architect a written proposal, properly itemized and supported by sufficient substantiating data to facilitate evaluation. The stated

time within which the Contractor must submit a proposal may be extended if, within that time, the Contractor makes a written request with reasonable justification thereof.

(2) The Contractor may voluntarily offer a change proposal which, in the Contractor's opinion, will reduce the cost of construction, maintenance, or operation or will improve the cost-effective performance of an element of the Project, in which case the Owner, through the Architect, will accept, reject, or respond otherwise within 21 days after receipt of the proposal, or such other reasonable time as the Contractor may state in the proposal.

(3) If the Contractor's proposal is acceptable to the Owner, or is negotiated to the mutual agreement of the Contractor and Owner, the Architect will prepare an appropriate Contract Change Order for execution. Upon receipt of the fully executed Contract Change Order, the Contractor shall proceed with the change.

(4) In advance of delivery of a fully executed Contract Change Order, the Architect may furnish to the Contractor a written authorization to proceed with an agreed change. However, such an authorization shall be effective only if it:

(a) identifies the Contractor's accepted or negotiated proposal for the change,
(b) states the agreed adjustments, if any, in Contract Sum and Contract Time,
(c) states that funds are available to pay for the change, and
(d) is signed by the Owner.

(5) If the Contractor and Owner cannot agree on the amount of the adjustment in the Contract Sum for a change, the Owner, through the Architect, may order the Contractor to proceed with the change on a Force Account basis, but the net cost to the Owner shall not exceed the amount quoted in the Contractor's proposal. Such order shall state that funds are available to pay for the change.

(6) If the Contractor does not promptly respond to a request for a proposal, or the Owner determines that the change is essential to the final product of the Work and that the change must be effected immediately to avoid delay of the Project, the Owner may:

(a) determine with the Contractor a sufficient maximum amount to be authorized for the change and
(b) direct the Contractor to proceed with the change on a Force Account basis pending delivery of the Contractor's proposal, stating the maximum increase in the Contract Sum that is authorized for the change.

(7) Pending agreement of the parties or final resolution of any dispute of the total amount due the Contractor for a change in the Work, amounts not in dispute for such changes in the Work may be included in Applications for Payment accompanied by an interim Change Order indicating the parties' agreement with part of all of such costs or time extension. Once a dispute is resolved, it shall be implemented by preparation and execution of an appropriate Change Order.

ARTICLE 20
CLAIMS for EXTRA COST or EXTRA WORK

A. If the Contractor considers any instructions by the Architect, Owner, DCM Project Inspector, or public authority having jurisdiction to be contrary to the requirements of the Contract Documents and will involve extra work and/or cost under the Contract, the Contractor shall give the Architect

written notice thereof within ten days after receipt of such instructions, and in any event before proceeding to execute such work. As used in this Article, "instructions" shall include written or oral clarifications, directions, instructions, interpretations, or determinations.

B. The Contractor's notification pursuant to Paragraph 20.A shall state: (1) the date, circumstances, and source of the instructions, **(2)** that the Contractor considers the instructions to constitute a change to the Contract Documents and why, and **(3)** an estimate of extra cost and time that may be involved to the extent an estimate may be reasonably made at that time.

C. Except for claims relating to an emergency endangering life or property, no claim for extra cost or extra work shall be considered in the absence of prior notice required under Paragraph 20.A.

D. Within ten days of receipt of a notice pursuant to Paragraph 20.A, the Architect will respond in writing to the Contractor, stating one of the following:

(1) The cited instruction is rescinded.

(2) The cited instruction is a change in the Work and in which manner the Contractor is to proceed with procedures of Article 19, Changes in the Work.

(3) The cited instruction is reconfirmed, is not considered by the Architect to be a change in the Contract Documents, and the Contractor is to proceed with Work as instructed.

E. If the Architect's response to the Contractor is as in Paragraph 20.D(3), the Contractor shall proceed with the Work as instructed. If the Contractor continues to consider the instructions to constitute a change in the Contract Documents, the Contractor shall, within ten days after receiving the Architect's response, notify the Architect in writing that the Contractor intends to submit a claim pursuant to Article 24, Resolution of Claims and Disputes

ARTICLE 21
DIFFERING SITE CONDITIONS

A. DEFINITION

"Differing Site Conditions" are:

(1) subsurface or otherwise concealed physical conditions at the Project site which differ materially from those indicated in the Contract Documents, or

(2) unknown physical conditions at the Project site which are of an unusual nature, differing materially from conditions ordinarily encountered and generally recognized as inherent in construction activities of the character required by the Contract Documents.

B. PROCEDURES

If Differing Site Conditions are encountered, then the party discovering the condition shall promptly notify the other party before the condition is disturbed and in no event later than ten days after discovering the condition. Upon such notice and verification that a Differing Site Condition exists, the Architect will, with reasonable promptness and with the Owner's concurrence, make changes in the Drawings and/or Specifications as are deemed necessary to conform to the Differing

Site Condition. Any increase or decrease in the Contract Sum or Contract Time that is warranted by the changes will be made as provided under Article 19, Changes in the Work. If the Architect determines a Differing Site Condition has not been encountered, the Architect shall notify the Owner and Contractor in writing, stating the reason for that determination.

ARTICLE 22
CLAIMS for DAMAGES

If either party to the Contract 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, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time after the discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

ARTICLE 23
DELAYS

A. A delay beyond the Contractor's control at any time in the commencement or progress of Work by an act or omission of the Owner, Architect, or any separate contractor or by labor disputes, unusual delay in deliveries, unavoidable casualties, fires, abnormal floods, tornadoes, or other cataclysmic events of nature, may entitle the Contractor to an extension of the Contract Time provided, however, that the Contractor shall, within ten days after the delay first occurs, give written notice to the Architect of the cause of the delay and its probable effect on progress of the entire Work.

B. Adverse weather conditions that are more severe than anticipated for the locality of the Work during any given month may entitle the Contractor to an extension of Contract Time provided, however;

(1) the weather conditions had an adverse effect on construction scheduled to be performed during the period in which the adverse weather occurred, which in reasonable sequence would have an effect on completion of the entire Work,

(2) the Contractor shall, within twenty-one days after the end of the month in which the delay occurs, give the Architect written notice of the delay that occurred during that month and its probable effect on progress of the Work, and

(3) within a reasonable time after giving notice of the delay, the Contractor provides the Architect with sufficient data to document that the weather conditions experienced were unusually severe for the locality of the Work during the month in question. Unless otherwise provided in the Contract Documents, data documenting unusually severe weather conditions shall compare actual weather conditions to the average weather conditions for the month in question during the previous five years as recorded by the National Oceanic and Atmospheric Administration (NOAA) or similar record-keeping entities.

C. Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual

written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.

D. The Contractor shall not be entitled to any adjustment of the Contract Sum for damage due to delays claimed pursuant to this Article unless the delay was caused by the Owner or Architect and was either:
(1) the result of bad faith or active interference or
(2) beyond the contemplation of the parties and not remedied within a reasonable time after notification by the Contractor of its presence.

ARTICLE 24
RESOLUTION of CLAIMS and DISPUTES

A. APPLICABILITY of ARTICLE

(1) As used in this Article, "Claims and Disputes" include claims or disputes asserted by the Contractor, its Surety, or Owner arising out of or related to the Contract, or its breach, including without limitation claims seeking, under the provisions of the Contract, equitable adjustment of the Contract Sum or Contract Time and claims and disputes arising between the Contractor (or its Surety) and Owner regarding interpretation of the Contract Documents, performance of the Work, or breach of or compliance with the terms of the Contract.

(2) "Resolution" addressed in this Article applies only to Claims and Disputes arising between the Contractor (or its Surety) and Owner and asserted after execution of the Construction Contract and prior to the date upon which final payment is made. Upon making application for final payment the Contractor may reserve the right to subsequent Resolution of existing Claims by including a list of all Claims, in stated amounts, which remain to be resolved and specifically excluding them from any release of claims executed by the Contractor, and in that event Resolution may occur after final payment is made.

B. CONTINUANCE of PERFORMANCE

An unresolved Claim or Dispute shall not be just cause for the Contractor to fail or refuse to proceed diligently with performance of the Contract or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

C. GOOD FAITH EFFORT to SETTLE

The Contractor and Owner agree that, upon the assertion of a Claim by the other, they will make a good faith effort, with the Architect's assistance and advice, to achieve mutual resolution of the Claim. If mutually agreed, the Contractor and Owner may endeavor to resolve a Claim through mediation. If efforts to settle are not successful, the Claim shall be resolved in accordance with paragraph D or E below, whichever applies.

D FINAL RESOLUTION for STATE-FUNDED CONTRACTS

(1) If the Contract is funded in whole or in part with state funds, the final Resolution of Claims

and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner shall be by the Director, whose decision shall be final, binding, and conclusive upon the Contractor, its Surety, and the Owner.

(2) When it becomes apparent to the party asserting a Claim (the Claimant) that an impasse to mutual resolution has been reached, the Claimant may request in writing to the Director that the Claim be resolved by decision of the Director. Such request by the Contractor (or its Surety) shall be submitted through the Owner. Should the Owner fail or refuse to submit the Contractor's request within ten days of receipt of same, the Contractor may forward such request directly to the Director. Upon receipt of a request to resolve a Claim, the Director will instruct the parties as to procedures to be initiated and followed.

(3) If the respondent to a Claim fails or refuses to participate or cooperate in the Resolution procedures to the extent that the Claimant is compelled to initiate legal proceedings to induce the Respondent to participate or cooperate, the Claimant will be entitled to recover, and may amend its Claim to include, the expense of reasonable attorney's fees so incurred.

E. FINAL RESOLUTION for LOCALLY-FUNDED CONTRACTS

If the Contract is funded in whole with funds provided by a city or county board of education or other local governmental authority and the Contract Documents do not stipulate a binding alternative dispute resolution method, the final resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner may be by any legal remedy available to the parties. Alternatively, upon the written agreement of the Contractor (or its Surety) and the Owner, final Resolution of Claims and Disputes may be by submission to binding arbitration before a neutral arbitrator or panel or by submission to the Director in accordance with preceding Paragraph D.

ARTICLE 25
OWNER'S RIGHT to CORRECT DEFECTIVE WORK

If the Contractor fails or refuses to correct Defective Work in a timely manner that will avoid delay of completion, use, or occupancy of the Work or work by the Owner or separate contractors, the Architect may give the Contractor written Notice to Cure the Defective Work within a reasonable, stated time. If within ten days after receipt of the Notice to Cure the Contractor has not proceeded and satisfactorily continued to cure the Defective Work or provided the Architect with written verification that satisfactory positive action is in process to cure the Defective Work, the Owner may, without prejudice to any other remedy available to the Owner, correct the Defective Work and deduct the actual cost of the correction from payment then or thereafter due to the Contractor.

ARTICLE 26
OWNER'S RIGHT to STOP or SUSPEND the WORK

A. STOPPING the WORK for CAUSE

If the Contractor fails to correct Defective Work or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work, or any part of the Work, until the cause for the Owner's directive has been eliminated;

however, the Owner's right to stop the Work shall not be construed as a duty of the Owner to be exercised for the benefit of the Contractor or any other person or entity.

B. SUSPENSION by the OWNER for CONVENIENCE

(1) The Owner may, at any time and without cause, direct the Contractor in writing to suspend, delay or interrupt the Work, or any part of the Work, for a period of time as the Owner may determine.

(2) The Contract Sum and Contract Time shall be adjusted, pursuant to Article 19, for reasonable increases in the cost and time caused by an Owner-directed suspension, delay or interruption of Work for the Owner's convenience. However, no adjustment to the Contract Sum shall be made to the extent that the same or concurrent Work is, was or would have been likewise suspended, delayed or interrupted for other reasons not caused by the Owner.

ARTICLE 27
OWNER'S RIGHT to TERMINATE CONTRACT

A. TERMINATION by the OWNER for CAUSE

(1) Causes: The Owner may terminate the Contractor's right to complete the Work, or any designated portion of the Work, if the Contractor:

(a) should be adjudged bankrupt, or should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency to the extent termination for these reasons is permissible under applicable law;

(b) refuses or fails to prosecute the Work, or any part of the Work, with the diligence that will insure its completion within the Contract Time, including any extensions, or fails to complete the Work within the Contract Time;

(c) refuses or fails to perform the Work, including prompt correction of Defective Work, in a manner that will insure that the Work, when fully completed, will be in accordance with the Contract Documents;

(d) fails to pay for labor or materials supplied for the Work or to pay Subcontractors in accordance with the respective Subcontract;

(e) persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction, or the instructions of the Architect or Owner; or

(f) is otherwise guilty of a substantial breach of the Contract.

(2) Procedure for Unbonded Construction Contracts (Generally, contracts less than $50,000):

(a) Notice to Cure: In the presence of any of the above conditions the Architect may give the Contractor written notice to cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor written notice that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the

written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a seven day Notice of Termination without giving the Contractor another Notice to Cure.

(d) At the expiration of the seven days of the termination notice, the Owner may:

.1 take possession of the site, of all materials and equipment stored on and off site, and of all Contractor-owned tools, construction equipment and machinery, and facilities located at the site, and

.2 finish the Work by whatever reasonable method the Owner may deem expedient.

(e) The Contractor shall not be entitled to receive further payment under the Contract until the Work is completed.

(f) If the Owner's cost of completing the Work, including correction of Defective Work, compensation for additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees due to the default and termination, is less than the unpaid balance of the Contract Sum, the excess balance less liquidated damages for delay shall be paid to the Contractor. If such cost to the Owner including attorney's fees, plus liquidated damages, exceeds the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner. Final Resolution of any claim or Dispute involving the termination or any amount due any party as a result of the termination shall be pursuant to Article 24.

(g) Upon the Contractor's request, the Owner shall furnish to the Contractor a detailed accounting of the Owner's cost of completing the Work.

(3) Procedure for Bonded Construction Contracts (Generally, contracts over $50,000):

(a) Notice to Cure: In the presence of any of the above conditions the Architect may give the Contractor and its Surety written Notice to Cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor and its Surety written notice declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a Notice of Termination without giving the Contractor another Notice to Cure.

(d) Demand on the Performance Bond: With the Notice of Termination the Owner shall give the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation to take charge of and complete the Work in accordance with the terms of the Performance Bond.

(e) Surety Claims: Upon receiving the Owner's demand on the Performance Bond, the Surety shall assume all rights and obligations of the Contractor under the Contract. However, the Surety shall also have the right to assert "Surety Claims" to the Owner, which are defined as claims relating to acts or omissions of the Owner or Architect prior to termination of the Contractor which may have prejudiced its rights as Surety or its interest in the unpaid balance of the Contract Sum. If the Surety wishes to assert a Surety Claim, it shall give the Owner, through the Architect, written notice within twenty-one days after first recognizing the

condition giving rise to the Surety Claim. The Surety Claim shall then be submitted to the Owner, through the Architect, no later than sixty days after giving notice thereof, but no such Surety Claims shall be considered if submitted after the date upon which final payment becomes due. Final resolution of Surety Claims shall be pursuant to Article 24, Resolution of Claims and Disputes. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

(f) Payments to Surety: The Surety shall be paid for completing the Work in accordance with the Contract Documents as if the Surety were the Contractor. The Owner shall have the right to deduct from payments to the Surety any reasonable costs incurred by the Owner, including compensation for additional architectural, engineering, managerial, and administrative services, and attorneys' fees as necessitated by termination of the Contractor and completion of the Work by the Surety. No further payments shall be made to the Contractor by the Owner. The Surety shall be solely responsible for any accounting to the Contractor for the portion of the Contract Sum paid to Surety by Owner or for the costs and expenses of completing the Work.

(4) Wrongful Termination: If any notice of termination by the Owner for cause, made in good faith, is determined to have been wrongly given, such termination shall be effective and compensation therefore determined as if it had been a termination for convenience pursuant to Paragraph B below.

B. TERMINATION by the OWNER for CONVENIENCE

(1) The Owner may, without cause and at any time, terminate the performance of Work under the Contract in whole, or in part, upon determination by the Owner that such termination is in the Owner's best interest. Such termination is referred to herein as Termination for Convenience.

(2) Upon receipt of a written notice of Termination for Convenience from the Owner, the Contractor shall:

(a) stop Work as specified in the notice;

(b) enter into no further subcontracts or purchase orders for materials, services, or facilities, except as may be necessary for Work directed to be performed prior to the effective date of the termination or to complete Work that is not terminated;

(c) terminate all existing subcontracts and purchase orders to the extent they relate to the terminated Work;

(d) take such actions as are necessary, or directed by the Architect or Owner, to protect, preserve, and make safe the terminated Work; and

(e) complete performance of the Work that is not terminated.

(3) In the event of Termination for Convenience, the Contractor shall be entitled to receive payment for the Work performed prior to its termination, including materials and equipment purchased and delivered for incorporation into the terminated Work, and any reasonable costs incurred because of the termination. Such payment shall include reasonable mark-up of costs for overhead and profit, not to exceed the limits stated in Article 19, Changes in the Work. The Contractor shall be entitled to receive payment for reasonable anticipated overhead ("home office") and shall not be entitled to receive payment for any profits anticipated to have been gained from the terminated Work. A proposal for decreasing the Contract Sum shall be submitted to the Architect by the Contractor in such time and detail, and with such supporting documentation, as is reasonably

directed by the Owner. Final modification of the Contract shall be by Contract Change Order pursuant to Article 19. Any Claim or Dispute involving the termination or any amount due a party as a result shall be resolved pursuant to Article 24.

ARTICLE 28
CONTRACTOR'S RIGHT to SUSPEND or TERMINATE the CONTRACT

A. SUSPENSION by the OWNER

If all of the Work is suspended or delayed for the Owner's convenience or under an order of any court, or other public authority, for a period of sixty days, through no act or fault of the Contractor or a Subcontractor, or anyone for whose acts they may be liable, then the Contractor may give the Owner a written Notice of Termination which allows the Owner fourteen days after receiving the Notice in which to give the Contractor appropriate written authorization to resume the Work. Absent the Contractor's receipt of such authorization to resume the Work, the Contract shall terminate upon expiration of this fourteen day period and the Contractor will be compensated by the Owner as if the termination had been for the Owner's convenience pursuant to Article 27.B.

B. NONPAYMENT

The Owner's failure to pay the undisputed amount of an Application for Payment within sixty days after receiving it from the Architect (Certified pursuant to Article 30) shall be just cause for the Contractor to give the Owner fourteen days' written notice that the Work will be suspended pending receipt of payment but that the Contract shall terminate if payment is not received within fourteen days (or a longer period stated by the Contractor) of the expiration of the fourteen day notice period.

(1) If the Work is then suspended for nonpayment, but resumed upon receipt of payment, the Contractor will be entitled to compensation as if the suspension had been by the Owner pursuant to Article 26, Paragraph B.

(2) If the Contract is then terminated for nonpayment, the Contractor will be entitled to compensation as if the termination had been by the Owner pursuant to Article 27, Paragraph B.

ARTICLE 29
PROGRESS PAYMENTS

A. FREQUENCY of PROGRESS PAYMENTS

Unless otherwise provided in the Contract Documents, the Owner will make payments to the Contractor as the Work progresses based on monthly estimates prepared and certified by the Contractor, approved and certified by the Architect, and approved by the Owner and other authorities whose approval is required.

B. SCHEDULE of VALUES

Within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a

DCM Form C-10SOV, Schedule of Values, which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall be printable on 8.5" × 11" for DCM's scanning purposes and shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

C. APPLICATIONS for PAYMENTS

(1) Based on the approved Schedule of Values, each DCM Form C-10, Application and Certificate for Payment shall show the Contractor's estimate of the value of Work performed in each line item as of the end of the billing period. The Contractor's cost of materials and equipment not yet incorporated into the Work, but delivered and suitably stored on the site, may be considered in monthly Applications for Payment. One payment application per month may be submitted. Each DCM Form C-10, Application and Certificate for Payment shall match to the penny and be accompanied by an attached DCM Form C-10SOV, Schedule of Values.

(2) The Contractor's estimate of the value of Work performed and stored materials must represent such reasonableness as to warrant certification by the Architect to the Owner in accordance with Article 30. Each monthly Application for Payment shall be supported by such data as will substantiate the Contractor's right to payment, including without limitation copies of requisitions from subcontractors and material suppliers.

(3) If no other date is stated in the Contract Documents or agreed upon by the parties, each Application for Payment shall be submitted to the Architect on or about the first day of each month and payment shall be issued to the Contractor within thirty days after an Application for Payment is Certified pursuant to Article 30 and delivered to the Owner.

(4) Two copies of DCM Form C-10, Application and Certificate for Payment containing original signatures, with each copy of DCM Form C-10 to include all attachments, shall be submitted to DCM for review following the Contractor's, Notary's (for paper submittals), Architect's and Owner's signatures.

D. MATERIALS STORED OFF SITE

Unless otherwise provided in the Contract Documents, the Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off the site, may also be considered in monthly Applications for Payment under the following conditions:

(1) the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location;

(2) a Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party;

(3) the Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate

inspection and verification of the presence of the materials or equipment by the Architect or Owner;

(4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner; and

(5) 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.

E. RETAINAGE

(1) "Retainage" is defined as the money earned and, therefore, belonging to the Contractor (subject to final settlement of the Contract) which has been retained by the Owner conditioned on final completion and acceptance of all Work required by the Contract Documents. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work.

(2) In making progress payments the Owner shall retain five percent of the estimated value of Work performed and the value of the materials stored for the Work; but after retainage has been held upon fifty percent of the Contract Sum, no additional retainage will be withheld.

F. CONTRACTOR'S CERTIFICATION

(1) Each Application for Payment shall bear the Contractor's notarized certification that, to the best of the Contractor's knowledge, information, and belief, the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payments were issued and payments received from the Owner and that the current payment shown in the Application for Payment has not yet been received.

(2) By making this certification the Contractor represents to the Architect and Owner that, upon receipt of previous progress payments from the Owner, the Contractor has promptly paid each Subcontractor, in accordance with the terms of its agreement with the Subcontractor, the amount due the Subcontractor from the amount included in the progress payment on account of the Subcontractor's Work and stored materials. The Architect and Owner may advise Subcontractors and suppliers regarding percentages of completion or amounts requested and/or approved in an Application for Payment on account of the Subcontractor's Work and stored materials.

G. PAYMENT ESTABLISHES OWNERSHIP

All material and Work covered by progress payments shall become the sole property of the Owner, but the Contractor shall not be relieved from the sole responsibility for the care and protection of material and Work upon which payments have been made and for the restoration of any damaged material and Work.

ARTICLE 30
CERTIFICATION and APPROVALS for PAYMENT

A. The Architect's review, approval, and certification of Applications for Payment shall be based on the Architect's general knowledge of the Work obtained through site visits and the information

provided by the Contractor with the Application. The Architect shall not be required to perform exhaustive examinations, evaluations, or estimates of the cost of completed or uncompleted Work or stored materials to verify the accuracy of amounts requested by the Contractor, but the Architect shall have the authority to adjust the Contractor's estimate when, in the Architect's reasonable opinion, such estimates are overstated or understated.

B. Within seven days after receiving the Contractor's monthly Application for Payment, or such other time as may be stated in the Contract Documents, the Architect will take one of the following actions:

(1) The Architect will approve and certify the Application as submitted and forward it to the Owner as a Certification for Payment for approval by the Owner (and other approving authorities, if any) and payment.

(2) If the Architect takes exception to any amounts claimed by the Contractor and the Contractor and Architect cannot agree on revised amounts, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to certify to the Owner, transmitting a copy of same to the Contractor.

(3) To the extent the Architect determines may be necessary to protect the Owner from loss on account of any of the causes stated in Article 31, the Architect may subtract from the Contractor's estimates and will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due and notify the Contractor and Owner in writing of the Architect's reasons for withholding payment in whole or in part.

C. Neither the Architect's issuance of a Certificate for Payment nor the Owner's resulting progress payment shall be a representation to the Contractor that the Work in progress or completed at that time is accepted or deemed to be in conformance with the Contract Documents.

D. The Architect shall not be required to determine that the Contractor has promptly or fully paid Subcontractors and suppliers or how or for what purpose the Contractor has used monies paid under the Construction Contract. However, the Architect may, upon request and if practical, inform any Subcontractor or supplier of the amount, or percentage of completion, approved or paid to the Contractor on account of the materials supplied or the Work performed by the Subcontractor.

ARTICLE 31
PAYMENTS WITHHELD

A. The Architect may nullify or revise a previously issued Certificate for Payment prior to Owner's payment thereunder to the extent as may be necessary in the Architect's opinion to protect the Owner from loss on account of any of the following causes not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:

(1) Defective Work;
(2) filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;
(3) the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;
(4) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

(5) damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;
(6) reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or
(7) the Contractor's persistent failure to conform to the requirements of the Contract Documents.

B. If the Owner deems it necessary to withhold payment pursuant to preceding Paragraph A, the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.

C. The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.

(1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.

(2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.

D. The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.

E. The Owner shall have the right to withhold from payments due the Contractor under this Contract an amount equal to any amount which the Contractor owes the Owner under another contract.

ARTICLE 32
SUBSTANTIAL COMPLETION

A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion of 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 without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items). Substantial Completion of the Work, or a designated portion of the Work, is not achieved until so agreed in a Certificate of Substantial Completion signed by the Contractor, Architect, Owner, and Technical Staff of the Alabama Division of Construction Management.

B. The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items

remaining to be completed or corrected for Final Acceptance prior to final payment.

C. Substantial Completion is achieved and a Final Inspection is appropriate only when a minimal number of punch list items exists and only a short period of time will be required to correct or complete them. Upon receipt of the Contractor's notice for a Final Inspection, the Architect will advise the Contractor in writing of any conditions of the Work which the Architect or Owner is aware do not constitute Substantial Completion, otherwise, a Final Inspection will proceed within a reasonable time after the Contractor's notice is given. However, the Architect will not be required to prepare lengthy listings of punch list items; therefore, if the Final Inspection discloses that Substantial Completion has not been achieved, the Architect may discontinue or suspend the inspection until the Contractor does achieve Substantial Completion.

D. <u>CERTIFICATE of SUBSTANTIAL COMPLETION</u>

(1) When the Work or a designated portion of the Work is substantially complete, the Architect will prepare and sign a Certificate of Substantial Completion to be signed in order by the Contractor, Owner, and Alabama Division of Construction Management.

(2) When signed by all parties, the Certificate of Substantial Completion shall establish the Date of Substantial Completion which is the date upon which:

(a) the Work, or designated portion of the Work, is accepted by the Architect, Owner, and Alabama Division of Construction Management as being ready for occupancy,

(b) the Contractor's one-year and special warranties for the Work covered by the Certificate commence, unless stated otherwise in the Certificate (the one-year warranty for punch list items completed or corrected after the period allowed in the Certificate shall commence on the date of their Final Acceptance), and

(c) Owner becomes responsible for building security, maintenance, utility services, and insurance, unless stated otherwise in the Certificate.

(3) The Certificate of Substantial Completion shall set the time within which the Contractor shall finish all items on the "punch list" accompanying the Certificate. The completion of punch list items shall be a condition precedent to Final Payment.

(4) If the Work or designated portion covered by a Certificate of Substantial Completion includes roofing work, the General Contractor's (5-year) Roofing Guarantee, DCM Form C-9, must be executed by the Contractor and attached to the Certificate of Substantial Completion. If the Contract Documents specify any other roofing warranties to be provided by the roofing manufacturer, Subcontractor, or Contractor, they must also be attached to the Certificate of Substantial Completion. The Alabama Division of Construction Management will not sign the Certificate of Substantial Completion in the absence of the roofing guarantees.

E. The Date of Substantial Completion of the Work, as set in the Certificate of Substantial Completion of the Work or of the last completed portion of the Work, establishes the extent to which the Contractor is liable for Liquidated Damages, if any; however, should the Contractor fail to complete all punch list items within thirty days, or such other time as may be stated in the respective Certificate of Substantial Completion, the Contractor shall bear any expenses, including additional Architectural services and expenses, incurred by the Owner as a result of such failure to complete punch list items in a timely manner.

ARTICLE 33
OCCUPANCY or USE PRIOR to COMPLETION

A. UPON SUBSTANTIAL COMPLETION

Prior to completion of the entire Work, the Owner may occupy or begin utilizing any designated portion of the Work on the agreed Date of Substantial Completion of that portion of the Work.

B. BEFORE SUBSTANTIAL COMPLETION

(1) The Owner shall not occupy or utilize any portion of the Work before Substantial Completion of that portion has been achieved.

(2) The Owner may deliver furniture and equipment and store, or install it in place ready for occupancy and use, in any designated portion of the Work before it is substantially completed under the following conditions:

(a) The Owner's storage or installation of furniture and equipment will not unreasonably disrupt or interfere with the Contractor's completion of the designated portion of the Work.

(b) The Contractor consents to the Owner's planned action (such consent shall not be unreasonably withheld).

(c) The Owner shall be responsible for insurance coverage of the Owner's furniture and equipment, and the Contractor's liability shall not be increased.

(d) The Contractor, Architect, and Owner will jointly inspect and record the condition of the Work in the area before the Owner delivers and stores or installs furniture and equipment; the Owner will equitably compensate the Contractor for making any repairs to the Work that may subsequently be required due to the Owner's delivery and storage or installation of furniture and equipment.

(e) The Owner's delivery and storage or installation of furniture and equipment shall not be deemed an acceptance of any Work not completed in accordance with the requirements of the Contract Documents.

ARTICLE 34
FINAL PAYMENT

A. PREREQUISITES to FINAL PAYMENT

The following conditions are prerequisites to Final Payment becoming due the Contractor:

(1) Full execution of a Certificate of Substantial Completion for the Work, or each designated portion of the Work.

(2) Final Acceptance of the Work.

(3) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements of the Contract Documents; such as delivery of "as-built" documents, operating and maintenance manuals, warranties, etc.

(4) Delivery to the Owner of a final Application for Payment, prepared by the Contractor and approved and certified by the Architect. Architect prepares DCM Form B-13: Final Payment Checklist and forwards it to the Owner along with the final Application for Payment.

(5) Completion of an Advertisement for Completion pursuant to Paragraph C below.

(6) Delivery by the Contractor to the Owner through the Architect of DCM Form C-18:

Contractor's Affidavit of Payment of Debts and Claims, and a Release of Claims, if any, and such other documents as may be required by Owner, satisfactory in form to the Owner pursuant to Paragraph D below.

(7) Consent of Surety to Final Payment, if any, to Contractor. This Consent of Surety is required for projects which have Payment and Performance Bonds.

(8) Delivery by the Contractor to the Architect and Owner of other documents, if any, required by the Contract Documents as prerequisites to Final Payment.

(9) See Manual of Procedures Chapter 7, Section L.7 concerning reconciliation of contract time, if any.

B. FINAL ACCEPTANCE of the WORK

"Final Acceptance of the Work" shall be achieved when all "punch list" items recorded with the Certificate(s) of Substantial Completion are accounted for by either: **(1)** their completion or correction by the Contractor and acceptance by the Architect, Owner, and DCM Project Inspector, or **(2)** their resolution under Article 18, Deductions for Uncorrected Work.

C. ADVERTISEMENT for COMPLETION

(1) If the Contract Sum is $50,000 or less: The Owner, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion published one time in a newspaper of general circulation, published in the county in which the Owner is located for one week, and shall require the Contractor to certify under oath that all bills have been paid in full. Final payment may be made at any time after the notice has been posted for one entire week.

(2) If the Contract Sum is more than $50,000: The Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion, similar to the sample contained in the Project Manual, published for a period of four successive weeks in some newspaper of general circulation published within the city or county where the Work was performed. Proof of publication of the Advertisement for Completion shall be made by the Contractor to the Architect by affidavit of the publisher, in duplicate, and a printed copy of the Advertisement for Completion published, in duplicate. If no newspaper is published in the county where the work was done, the notice may be given by posting at the Court House for thirty days and proof of same made by Probate Judge or Sheriff and the Contractor. Final payment shall not be due until thirty days after this public notice is completed.

D. RELEASE of CLAIMS

The Release of Claims and other documents referenced in Paragraph A(6) above are as follows:

(1) A release executed by Contractor of all claims and claims of lien against the Owner arising under and by virtue of the Contract, other than such claims of the Contractor, if any, as may have been previously made in writing and as may be specifically excepted by the Contractor from the operation of the release in stated amounts to be set forth therein.

(2) An affidavit under oath, if required, stating that so far as the Contractor has knowledge or information, there are no claims or claims of lien which have been or will be filed by any Subcontractor, Supplier or other party for labor or material for which a claim or claim of lien could

be filed.

(3) A release, if required, of all claims and claims of lien made by any Subcontractor, Supplier or other party against the Owner or unpaid Contract funds held by the Owner arising under or related to the Work on the Project; provided, however, that if any Subcontractor, Supplier or others refuse to furnish a release of such claims or claims of lien, the Contractor may furnish a bond executed by Contractor and its Surety to the Owner to provide an unconditional obligation to defend, indemnify and hold harmless the Owner against any loss, cost or expense, including attorney's fees, arising out of or as a result of such claims, or claims of lien, in which event Owner may make Final Payment notwithstanding such claims or claims of lien. If Contractor and Surety fail to fulfill their obligations to Owner under the bond, the Owner shall be entitled to recover damages as a result of such failure, including all costs and reasonable attorney's fees incurred to recover such damages.

E. EFFECT of FINAL PAYMENT

(1) The making of Final Payment shall constitute a waiver of Claims by the Owner except those arising from:

- **(a)** liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
- **(b)** failure of the Work to comply with the requirements of the Contract Documents;
- **(c)** terms of warranties or indemnities required by the Contract Documents, or
- **(d)** latent defects.

(2) Acceptance of Final Payment by the Contractor shall constitute a waiver of claims by Contractor except those previously made in writing, identified by Contractor as unsettled at the time of final Application for Payment, and specifically excepted from the release provided for in Paragraph D(1), above.

ARTICLE 35
CONTRACTOR'S WARRANTY

A. GENERAL WARRANTY

The Contractor warrants to the Owner and Architect that all materials and equipment furnished under the Contract will be of good quality and new, except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise, and that none of the Work will be Defective Work as defined in Article 1.

B. ONE-YEAR WARRANTY

(1) If, within one year after the date of Substantial Completion of the Work or each designated portion of the Work (or otherwise as agreed upon in a mutually-executed Certificate of Substantial Completion), any of the Work is found to be Defective Work, the Contractor shall promptly upon receipt of written notice from the Owner or Architect, and without expense to either, replace or correct the Defective Work to conform to the requirements of the Contract Documents, and repair all damage to the site, the building and its contents which is the result of Defective Work or its replacement or correction.

(2) The one-year warranty for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial

Completion in which they are recorded. The one-year warranty for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion, and other Work performed after Substantial Completion, shall begin on the date of Final Acceptance of the Work. The Contractor's correction of Work pursuant to this warranty does not extend the period of the warranty. The Contractor's one-year warranty does not apply to defects or damages due to improper or insufficient maintenance, improper operation, or wear and tear during normal usage.

(3) Upon recognizing a condition of Defective Work, the Owner shall promptly notify the Contractor of the condition. If the condition is causing damage to the building, its contents, equipment, or site, the Owner shall take reasonable actions to mitigate the damage or its continuation, if practical. If the Contractor fails to proceed promptly to comply with the terms of the warranty, or to provide the Owner with satisfactory written verification that positive action is in process, the Owner may have the Defective Work replaced or corrected and the Contractor and the Contractor's Surety shall be liable for all expense incurred.

(4) Year-end Inspection(s): An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one-year warranty period(s). The inspection must be scheduled with the Owner, Architect and DCM Inspector. The subsequent delivery of the Architect's report of a Year-end Inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period.

(5) The Contractor's warranty of one year is in addition to, and not a limitation of, any other remedy stated herein or available to the Owner under applicable law.

C. GENERAL CONTRACTOR'S ROOFING GUARANTEE

(1) In addition to any other roof related warranties or guarantees that may be specified in the Contract Documents, the roof and associated work shall be guaranteed by the General Contractor against leaks and defects of materials and workmanship for a period of five (5) years, starting on the Date of Substantial Completion of the Project as stated in the Certificate of Substantial Completion. This guarantee for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The guarantee for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion shall begin on the date of Final Acceptance of the Work.

(2) The "General Contractor's Roofing Guarantee" (DCM Form C-9), included in the Project Manual, shall be executed in triplicate, signed by the appropriate party and submitted to the Architect for submission with the Certificate of Substantial Completion to the Owner and the Division of Construction Management.

(3) This guarantee does not include costs which might be incurred by the General Contractor in making visits to the site requested by the Owner regarding roof problems that are due to lack of proper maintenance (keeping roof drains and/or gutters clear of debris that cause a stoppage of drainage which results in water ponding, overflowing of flashing, etc.), or damages caused by vandalism or misuse of roof areas. Should the contractor be required to return to the job to correct problems of this nature that are determined not to be related to faulty workmanship and materials in the installation of the roof, payment for actions taken by the Contractor in response to such request will be the responsibility of the Owner. A detailed written report shall be made by the General

Contractor on each of these 'Service Calls' with copies to the Architect, Owner and Division of Construction Management.

D. SPECIAL WARRANTIES

(1) The Contractor shall deliver to the Owner through the Architect all special or extended warranties required by the Contract Documents from the Contractor, Subcontractors, and suppliers.

(2) The Contractor and the Contractor's Surety shall be liable to the Owner for such special warranties during the Contractor's one-year warranty; thereafter, the Contractor's obligations relative to such special warranties shall be to provide reasonable assistance to the Owner in their enforcement.

E. ASSUMPTION of GUARANTEES of OTHERS

If the Contractor disturbs, alters, or damages any work guaranteed under a separate contract, thereby voiding the guarantee of that work, the Contractor shall restore the work to a condition satisfactory to the Owner and shall also guarantee it to the same extent that it was guaranteed under the separate contract.

ARTICLE 36
INDEMNIFICATION AGREEMENT

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants (hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of, related to, 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, including loss of use resulting therefrom, and is caused in whole or in part by 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 such claim, damage, loss or expense is caused in part, or is alleged but not legally established to have been caused in whole or in part by the negligence or other fault of a party indemnified hereunder.

A. This indemnification shall extend to all claims, damages, losses and expenses for injury or damage to adjacent or neighboring property, or persons injured thereon, that arise out of, relate to, or result from performance of the Work.

B. This indemnification does not extend to the liability of the Architect, or the Architect's Consultants, agents, or employees, arising out of **(1)** the preparation or approval of maps, shop drawings, opinions, reports, surveys, field orders, Change Orders, drawings or specifications, or **(2)** the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions is the primary cause of the injury or damage.

C. This indemnification does not apply to the extent of the sole negligence of the Indemnitees.

ARTICLE 37
CONTRACTOR'S and SUBCONTRACTORS' INSURANCE

(Provide entire Article 37 to Contractor's insurance representative.)

A. GENERAL

(1) RESPONSIBILITY. The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

(2) INSURANCE PROVIDERS. Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

(3) NOTIFICATION ENDORSEMENT. Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

(4) INSURANCE CERTIFICATES. The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract. The insurance certificate must provide the following:

- **(a)** Name and address of authorized agent of the insurance company
- **(b)** Name and address of insured
- **(c)** Name of insurance company or companies
- **(d)** Description of policies
- **(e)** Policy Number(s)
- **(f)** Policy Period(s)
- **(g)** Limits of liability
- **(h)** Name and address of Owner as certificate holder
- **(i)** Project Name and Number, if any
- **(j)** Signature of authorized agent of the insurance company
- **(k)** Telephone number of authorized agent of the insurance company
- **(l)** Mandatory thirty day notice of cancellation / non-renewal / change

(5) MAXIMUM DEDUCTIBLE. Self-insured retention, except for qualified self-insurers or

group self-insurers, in any policy shall not exceed $25,000.00.

B. INSURANCE COVERAGES

Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability limits not less than as follows:

(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE

(a) Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims.

(b) Employer's Liability Insurance limits shall be at least:

.1 Bodily Injury by Accident - $1,000,000 each accident

.2 Bodily Injury by Disease - $1,000,000 each employee

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

(a) Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

Coverage	Limit
.1 General Aggregate	$ 2,000,000.00 per Project
.2 Products, Completed Operations Aggregate	$ 2,000,000.00 per Project
.3 Personal and Advertising Injury	$ 1,000,000.00 per Occurrence
.4 Each Occurrence	$ 1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

.1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.

.2 The policy must include separate per project aggregate limits.

(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE

(a) Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

(b) The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.

(4) COMMERCIAL UMBRELLA LIABILITY INSURANCE

(a) Commercial Umbrella Liability Insurance to provide excess coverage above the

Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.

(b) Minimum Combined Primary Commercial General Liability and Commercial/Excess Umbrella Limits of:

.1 $ 5,000,000 per Occurrence

.2 $ 5,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella Liability Insurance:

.1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.

.2 The policy must be on an "occurrence" basis.

(5) BUILDER'S RISK INSURANCE

(a) The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss - Special Form (current edition as of the date of Advertisement for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.

(b) The policy shall be endorsed as follows:

"The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

(i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or

(ii) Partial or complete occupancy by Owner; or

(iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

C. SUBCONTRACTORS' INSURANCE

(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE. The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph B, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.

(2) LIABILITY INSURANCE. The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella Liability Insurance coverages similar to those described in preceding Paragraph B. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.

(3) ENFORCEMENT RESPONSIBILITY. The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of insurance for any Subcontractor.

D. TERMINATION of OBLIGATION to INSURE

Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

(1) BUILDER'S RISK INSURANCE. The obligation to insure under Subparagraph B(5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

(2) PRODUCTS and COMPLETED OPERATIONS. The obligation to carry Products and Completed Operations coverage specified under Subparagraph B(2) shall remain in effect for two years after the Date(s) of Substantial Completion.

(3) ALL OTHER INSURANCE. The obligation to carry other insurance coverages specified under Subparagraphs B(1) through B(4) and Paragraph C shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

E. WAIVERS of SUBROGATION

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, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work.

ARTICLE 38
PERFORMANCE and PAYMENT BONDS

A. GENERAL

Upon signing and returning the Construction Contract to the Owner for final approval and execution, the Contractor shall, at the Contractor's expense, furnish to the Owner a Performance Bond and a Payment Bond (P&P Bonds), DCM Forms C-6 and C-7 as contained in the Project

Manual, each in a penal sum equal to 100% of the Contract Sum. Each bond shall be on the form contained in the Project Manual, shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount. There shall be three original P&P Bonds submitted with original signatures for each of the three contracts required. The P&P bonds must be signed either on the same day or after the construction contract date. Each P&P Bond shall have attached thereto an original power of attorney (POA) of the signing official. The POA signature date must be the same day as the P&P Bond's signature date. All signatures must be present.

The provisions of this Article are not applicable to this Contract if the Contract Sum is less than $50,000, unless bonds are required for this Contract in the Supplemental General Conditions.

B. PERFORMANCE BOND

Through the Performance Bond, the Surety's obligation to the Owner shall be to assure the prompt and faithful performance of the Contract and Contract Change Orders. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. In case of default on the part of the Contractor, the Surety shall take charge of and complete the Work in accordance with the terms of the Performance Bond. Any reasonable expenses incurred by the Owner as a result of default on the part of the Contractor, including architectural, engineering, administrative, and legal services, shall be recoverable under the Performance Bond.

C. PAYMENT BOND

Through the Payment Bond the Surety's obligation to the Owner shall be to guarantee that the Contractor and its Subcontractors shall promptly make payment to all persons supplying labor, materials, or supplies for, or in, the prosecution of the Work, including the payment of reasonable attorneys fees incurred by successful claimants or plaintiffs in civil actions on the Bond. Any person or entity indicating that they have a claim of nonpayment under the Bond shall, upon written request, be promptly furnished a certified copy of the Bond and Construction Contract by the Contractor, Architect, Owner, or Alabama Division of Construction Management, whomever is recipient of the request.

D. CHANGE ORDERS

The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

E. EXPIRATION

The obligations of the Contractor's performance bond surety shall be coextensive with the contractor's performance obligations under the Contract Documents; provided, however, that the surety's obligation shall expire at the end of the one-year warranty period(s) of Article 35.

ARTICLE 39
ASSIGNMENT

The Contractor shall not assign the Contract or sublet it as a whole nor assign any moneys due or to

become due to the Contractor thereunder without the previous written consent of the Owner (and of the Surety, in the case of a bonded Construction Contract). As prescribed by the Public Works Law, the Contract shall in no event be assigned to an unsuccessful bidder for the Contract whose bid was rejected because the bidder was not a responsible or responsive bidder.

ARTICLE 40
CONSTRUCTION by OWNER or SEPARATE CONTRACTORS

A. OWNER'S RESERVATION of RIGHT

(1) The Owner reserves the right to self-perform, or to award separate contracts for, other portions of the Project and other Project related construction and operations on the site. The contractual conditions of such separate contracts shall be substantially similar to those of this Contract, including insurance requirements and the provisions of this Article. If the Contractor considers such actions to involve delay or additional cost under this Contract, notifications and assertion of claims shall be as provided in Article 20 and Article 23.

(2) When separate contracts are awarded, the term "Contractor" in the separate Contract Documents shall mean the Contractor who executes the respective Construction Contract.

B. COORDINATION

Unless otherwise provided in the Contract Documents, the Owner shall be responsible for coordinating the activities of the Owner's forces and separate contractors with the Work of the Contractor. The Contractor shall cooperate with the Owner and separate contractors, shall participate in reviewing and comparing their construction schedules relative to that of the Contractor when directed to do so, and shall make and adhere to any revisions to the construction schedule resulting from a joint review and mutual agreement.

C. CONDITIONS APPLICABLE to WORK PERFORMED by OWNER

Unless otherwise provided in the Contract Documents, when the Owner self-performs construction or operations related to the Project, the Owner shall be subject to the same obligations to Contractor as Contractor would have to a separate contractor under the provision of this Article 40.

D. MUTUAL RESPONSIBILITY

(1) The Contractor shall reasonably accommodate the required introduction and storage of materials and equipment and performance of activities by the Owner and separate contractors and shall connect and coordinate the Contractor's Work with theirs as required by the Contract Documents.

(2) By proceeding with an element or portion of the Work that is applied to or performed on construction by the Owner or a separate contractor, or which relies upon their operations, the Contractor accepts the condition of such construction or operations as being suitable for the Contractor's Work, except for conditions that are not reasonably discoverable by the Contractor. If the Contractor discovers any condition in such construction or operations that is not suitable for the proper performance of the Work, the Contractor shall not proceed, but shall instead promptly notify

the Architect in writing of the condition discovered.

(3) The Contractor shall reimburse the Owner for any costs incurred by a separate contractor and payable by the Owner because of acts or omissions of the Contractor. Likewise, the Owner shall be responsible to the Contractor for any costs incurred by the Contractor because of the acts or omissions of a separate contractor.

(4) The Contractor shall not cut or otherwise alter construction by the Owner or a separate contractor without the written consent of the Owner and separate contractor; such consent shall not be unreasonably withheld. Likewise, the Contractor shall not unreasonably withhold its consent allowing the Owner or a separate contractor to cut or otherwise alter the Work.

(5) The Contractor shall promptly remedy any damage caused by the Contractor to the construction or property of the Owner or separate contractors**.**

ARTICLE 41
SUBCONTRACTS

A. AWARD of SUBCONTRACTS and OTHER CONTRACTS for PORTIONS of the WORK

(1) Unless otherwise provided in the Contract Documents, when delivering the executed Construction Contract, bonds, and evidence of insurance to the Architect, the Contractor shall also submit a listing of Subcontractors proposed for each principal portion of the Work and fabricators or suppliers proposed for furnishing materials or equipment fabricated to the design of the Contract Documents. This listing shall be in addition to any naming of Subcontractors, fabricators, or suppliers that may have been required in the bid process. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any Subcontractor, fabricator, or supplier proposed by the Contractor. The issuance of the Notice to Proceed in the absence of such objection by the Owner shall constitute notice that no reasonable objection to them is made.

(2) The Contractor shall not contract with a proposed Subcontractor, fabricator, or supplier to whom the Owner has made reasonable and timely objection. Except in accordance with prequalification procedures as may be contained in the Contract Documents, through specified qualifications, or on the grounds of reasonable objection, the Owner may not restrict the Contractor's selection of Subcontractors, fabricators, or suppliers.

(3) Upon the Owner's reasonable objection to a proposed Subcontractor, fabricator, or supplier, the Contractor shall promptly propose another to whom the Owner has no reasonable objection. If the proposed Subcontractor, fabricator, or supplier to whom the Owner made reasonable objection was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be equitably adjusted by Contract Change Order for any resulting difference if the Contractor has acted promptly and responsively in this procedure.

(4) The Contractor shall not change previously selected Subcontractors, fabricators, or suppliers without notifying the Architect and Owner in writing of proposed substitute Subcontractors, fabricators, or suppliers. If the Owner does not make a reasonable objection to a proposed substitute within three working days, the substitute shall be deemed approved.

B. SUBCONTRACTUAL RELATIONS

(1) The Contractor agrees to bind every Subcontractor and material supplier (and require every Subcontractor to so bind its subcontractors and material suppliers) to all the provisions of the Contract Documents as they apply to the Subcontractor's and material supplier's portion of the Work.

(2) Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner, nor to create a duty of the Architect, Owner, or Director to resolve disputes between or among the Contractor or its Subcontractors and suppliers or any other duty to such Subcontractors or suppliers.

ARTICLE 42
ARCHITECT'S STATUS

A. The Architect is an independent contractor performing, with respect to this Contract, pursuant to an agreement executed between the Owner and the Architect. The Architect has prepared the Drawings and Specifications and assembled the Contract Document and is, therefore, charged with their interpretation and clarification as described in the Contract Documents. As a representative of the Owner, the Architect will endeavor to guard the Owner against variances from the requirements of the Contract Documents by the Contractor. On behalf of the Owner, the Architect will administer the Contract as described in the Contract Documents during construction and the Contractor's one-year warranty.

B. So as to maintain continuity in administration of the Contract and performance of the Work, and to facilitate complete documentation of the project record, all communications between the Contractor and Owner regarding matters of or related to the Contract shall be directed through the Architect, unless direct communication is otherwise required to provide a legal notification. Unless otherwise authorized by the Architect, communications by and with the Architect's consultants shall be through the Architect. Unless otherwise authorized by the Contractor, communications by and with Subcontractors and material suppliers shall be through the Contractor.

C. ARCHITECT'S AUTHORITY

Subject to other provisions of the Contract Documents, the following summarizes some of the authority vested in the Architect by the Owner with respect to the Construction Contract and as further described or conditioned in other Articles of these General Conditions of the Contract.

(1) The Architect is authorized to:

(a) approve "minor" deviations as defined in Article 9, Submittals,
(b) make "minor" changes in the Work as defined in Article 19, Changes in the Work,
(c) reject or require the correction of Defective Work,
(d) require the Contractor to stop the performance of Defective Work,
(e) adjust an Application for Payment by the Contractor pursuant to Article 30, Certification and Approval of payments, and
(f) issue Notices to Cure pursuant to Article 27.

(2) The Architect is not authorized to:

(a) revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations and changes) without concurrence of the Owner,

(b) finally approve or accept any portion of the Work without concurrence of the Owner,
(c) issue instructions contrary to the Contract Documents,
(d) issue Notice of Termination or otherwise terminate the Contract, or
(e) require the Contractor to stop the Work except only to avoid the performance of Defective Work.

D. LIMITATIONS of RESPONSIBILITIES

(1) The Architect shall not be responsible to Contractors or to others for supervising or coordinating the performance of the Work or for the Construction Methods or safety of the Work, unless the Contract Documents give other specific instructions concerning these matters.
(2) The Architect will not be responsible to the Contractor (nor the Owner) for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents or for acts or omissions of the Contractor, a Subcontractor, or anyone for whose acts they may be liable. However, the Architect will report to the Owner and Contractor any Defective Work recognized by the Architect.

(3) The Architect will endeavor to secure faithful performance by Owner and Contractor, and the Architect will not show partiality to either or be liable to either for results of interpretations or decisions rendered in good faith.

(4) The Contractor's remedies for additional time or expense arising out of or related to this Contract, or the breach thereof, shall be solely as provided for in the Contract Documents. The Contractor shall have no claim or cause of action against the Owner, Architect, or its consultants for any actions or failures to act, whether such claim may be in contract, tort, strict liability, or otherwise, it being the agreement of the parties that the Contractor shall make no claim against the Owner or any agents of the Owner, including the Architect or its consultants, except as may be provided for claims or disputes submitted in accordance with Article 24. The Architect and Architect's consultants shall be considered third party beneficiaries of this provision of the Contract and entitled to enforce same.

E. ARCHITECT'S DECISIONS

Decisions by the Architect shall be in writing The Architect's decisions on matters relating to aesthetic effect will be final and binding if consistent with the intent expressed in the Contract Documents. The Architect's decisions regarding disputes arising between the Contractor and Owner shall be advisory.

ARTICLE 43
CASH ALLOWANCES

A. All allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner and the Contractor shall afford the Owner the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.

B. Unless otherwise provided in the Contract Documents:
(1) allowances shall cover the cost to the Contractor of materials and equipment delivered to the

Project site and all applicable taxes, less applicable trade discounts;

(2) the Contractor's costs for unloading, storing, protecting, and handling at the site, labor, installation, overhead, profit and other expenses related to materials or equipment covered by an allowance shall be included in the Contract Sum but not in the allowances;

(3) if required, the Contract Sum shall be adjusted by Change Order to reflect the actual costs of an allowance.

C. Any selections of materials or equipment required of the Architect or Owner under an allowance shall be made in sufficient time to avoid delay of the Work.

ARTICLE 44
PERMITS, LAWS, and REGULATIONS

A. PERMITS, FEES AND NOTICES

(1) Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after award of the Construction Contract and which are in effect on the date of receipt of bids.

(2) The Contractor shall comply with and give notices required by all laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

B. TAXES

Unless stated otherwise in the Contract Documents, materials incorporated into the Work are exempt from sales and use tax pursuant to Section 40-9-33, Code of Alabama, 1975 as amended. The Owner, Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, & Business Tax Division of the Alabama Department of Revenue regarding certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors. The Contractor shall pay all applicable taxes that are not covered by the exemption of Section 40-9-33 and which are imposed as of the date of receipt of bids, including those imposed as of the date of receipt of bids but scheduled to go into effect after that date.

C. COMPENSATION for INCREASES

The Contractor shall be compensated for additional costs incurred because of increases in tax rates imposed after the date of receipt of bids.

D. ALABAMA IMMIGRATION LAW

Per ACT 2011-535 as codified in Title 31, Chapter 13 of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for

all damages resulting therefrom.

E. ALABAMA BOYCOTT LAW

Per Act 2016-312as codified in Title 41, Chapter 16, Article 1, of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

F. ACCOUNTING OF SALES TAX EXEMPT PROJECTS

Per Act 2013-205 as codified in Title 40, Chapter 9, Article 1, of the Code of Alabama, 1975, as amended:

In bidding the work on a tax exempt project, the bid form shall provide an accounting for the tax savings.

ARTICLE 45
ROYALTIES, PATENTS, and COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of, related to, or resulting from all suits or claims for infringement of any patent rights or copyrights arising out of the inclusion of any patented or copyrighted materials, methods, or systems selected by the Contractor and used during the execution of or incorporated into the Work. This indemnification does not apply to any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods, or systems specified in the Contract Documents. However, if the Contractor has information that a specified material, method, or system is or may constitute an infringement of a patent or copyright, the Contractor shall be responsible for any resulting loss unless such information is promptly furnished to the Architect.

ARTICLE 46
USE of the SITE

A. The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials, equipment, employees' vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.

B. Unless otherwise provided in the Contract Documents, temporary facilities, such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner.

Such temporary buildings and/or utilities shall remain the property of the Contractor, and be removed at the Contractor's expense upon completion of the Work, unless the Owner authorizes their abandonment without removal.

ARTICLE 47
CUTTING and PATCHING

A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to execute the Work to the results indicated in the Contract Documents or to make its parts fit together properly.

B. Any cutting, patching, or excavation by the Contractor shall be supervised and performed in a manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of the Owner or separate contractors.

ARTICLE 48
IN-PROGRESS and FINAL CLEANUP

A. IN-PROGRESS CLEAN-UP

(1) The Contractor shall at all times during the progress of the Work keep the premises and surrounding area free from rubbish, scrap materials and debris resulting from the Work. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings. Burning of trash and debris on site is not permitted.

(2) The Contractor shall make provisions to minimize and confine dust and debris resulting from construction activities.

B. FINAL CLEAN-UP

(1) Before Substantial Completion or Final Acceptance is achieved, the Contractor shall have removed from the Owner's property all construction equipment, tools, and machinery; temporary structures and/or utilities including the foundations thereof (except such as the Owner permits in writing to remain); rubbish, debris, and waste materials; and all surplus materials, leaving the site clean and true to line and grade, and the Work in a safe and clean condition, ready for use and operation.

(2) In addition to the above, and unless otherwise provided in the Contract Documents, the Contractor shall be responsible for the following special cleaning for all trades as the Work is completed:

(a) Cleaning of all painted, enameled, stained, or baked enamel work: Removal of all marks, stains, finger prints and splatters from such surfaces.

(b) Cleaning of all glass: Cleaning and removing of all stickers, labels, stains, and paint from all glass, and the washing and polishing of same on interior and exterior.

(c) Cleaning or polishing of all hardware: Cleaning and polishing of all hardware.

(d) Cleaning all tile, floor finish of all kinds: Removal of all splatters, stains, paint, dirt,

and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Architect.

(e) Cleaning of all manufactured articles, materials, fixtures, appliances, and equipment: Removal of all stickers, rust stains, labels, and temporary covers, and cleaning and conditioning of all manufactured articles, material, fixtures, appliances, and electrical, heating, and air conditioning equipment as recommended or directed by the manufacturers, unless otherwise required by the Architect; blowing out or flushing out of all foreign matter from all equipment, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers, sanitizing potable water systems; and freeing identification plates on all equipment of excess paint and the polishing thereof.

C. OWNER'S RIGHT to CLEAN-UP

If the Contractor fails to comply with these clean-up requirements and then fails to comply with a written directive by the Architect to clean-up the premises within a specified time, the Architect or Owner may implement appropriate clean-up measures and the cost thereof shall be deducted from any amounts due or to become due the Contractor.

ARTICLE 49
LIQUIDATED DAMAGES

A. Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including but not limited to interest and additional administrative, architectural, inspection and supervision charges. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.

B. The Contract Documents may provide in the Construction Contract or elsewhere for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree that such amount is reasonable and agree to be bound thereby.

C. If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.

D. The amount of liquidated damages due under either paragraph B or C, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

ARTICLE 50
USE of FOREIGN MATERIALS

A. In the performance of the Work the Contractor agrees to use materials, supplies, and products manufactured, mined, processed or otherwise produced in the United States or its territories, if same are available at reasonable and competitive prices and are not contrary to any sole source specification implemented under the Public Works Law.

B. In the performance of the Work the Contractor agrees to use steel produced in the United States if the Contract Documents require the use of steel and do not limit its supply to a sole source pursuant to the Public Works Law. If the Owner decides that the procurement of domestic steel products becomes impractical as a result of national emergency, national strike, or other cause, the Owner shall waive this restriction.

C. If domestic steel or other domestic materials, supplies, and products are not used in accordance with preceding Paragraphs A and B, the Contract Sum shall be reduced by an amount equal to any savings or benefits realized by the Contractor.

D. This Article applies only to Public Works projects financed entirely by the State of Alabama or any political subdivision of the state.

ARTICLE 51
PROJECT SIGN

A. Fully locally-funded State Agency and Public Higher Education projects: DCM Form C-15: Detail of Project Sign must be included in the project manual regardless of expected bid amount. If the awarded contract sum is $100,000.00 or more, Contractor shall furnish and erect a project sign. Other conditions besides the contract sum may warrant waiver of this requirement, but only with approval of the Technical Staff.

B. Fully locally-funded K-12 school projects: Project sign is not required unless requested by Owner; if project sign is requested by Owner, include DCM Form C-15: Detail of Project Sign in the project manual.

C. Partially or fully PSCA-funded projects: DCM Form C-15: Detail of Project Sign must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of the contract sum. "Alabama Public School and College Authority" as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects.

When required per the above conditions, the project sign shall be erected in a prominent location selected by the Architect and Owner and shall be maintained in good condition until completion of Work. If the Contract involves Work on multiple sites, only one project sign is required, which shall be erected on one of the sites in a location selected by the Architect and Owner. Slogan: The title of the current PSCA Act should be placed on the project sign of all PSCA-funded projects, otherwise the Awarding Authority/Owner's slogan, if any, should be used. If the Awarding Authority/Owner of a fully locally-funded project does not have a slogan, the project sign does not require a slogan.

END of
GENERAL CONDITIONS of the CONTRACT

SUPPLEMENTARY CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.01 PURPOSE

A. The changes, deletions and omissions to DCM Form C-8, General Conditions of the Contract, relate to the limited contract period of the project.

1. Article 16 - Inspection of the Work:
   a. Add Paragraph G: Follow-up observations will be performed by the Architect or Architect's Consultant each time a punchlist is generated to ensure that punchlist items have been corrected. The cost of additional observations required due to incomplete correction of punchlist items will be the responsibility of the Contractor at the rate of $150.00 per hour, including travel time.
   Shop Drawings and/or submittals requiring resubmission to the Architect due to non-compliance with the Contract Documents and /or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Architect for review. The Contractor shall ensure the completeness and compliance of the submittal materials. Cost incurred by the Owner for review of submittals after the second submittal is rejected will be the responsibility of the Contractor at the rate indicated in the paragraph above.
   b. Add Paragraph H - Punch List Expectations and its subparagraphs to read as follows:
      H. Punch List Expectations:
      The General Contractor is to generate a punch list; this list is to be sent to the Architect. After the Architect receives the General Contractors punch list, the Architect will generate a punch list, which will be distributed appropriately. The Architect will not recheck the punch list until the General Contractor notifies the Architect that all punch items are finished and all Subcontractors affected have signed off on. The General Contractor is responsible for getting the punch lists signed off of and send the signed lists to the Architect.
2. Article 19 - Changes in the work:
   a. Paragraph B (3) (f) - add subparagraph 1 and its subparagraphs to read as follows:
      1. The following fees apply to changes in the Work:
         a. 15 percent overhead and profit on the net cost of own Work;
         b. 10 percent on the cost of Work done by any subcontractor.
         c. The Agreement identifies the overhead and profit fees applicable for changes in the Work, whether additions to or deductions from the Work on which the Contract Sum is based and identifies the fees for subcontract work for changes (both additions and deductions in the Work. The Contractor shall apply fees as noted, to the Subcontractor's gross (net plus fee) costs on addition work.
   b. Paragraph D - add subparagraph (8) to read as follows:
      (8). All deductive Change Orders are to include a minimum 1 percent return for profit and overhead.
3. Article 23 - Delays: Paragraph B (2) - delete in its entirety. Time extensions as they relate to weather are outlined in the appendix "WEATHER DELAYS" attached hereto.
4. Article 29 - Schedule of Values: Add Article 29 in "Appendix C" attached hereto.
5. Article 44 - Permits, Laws, and Regulations,
   a. Paragraph A - Permits, Fees, and Notices - The General Contractor is not required to secure and pay for a building permit from the local inspection department.
   b. Paragraph A – Add subparagraph (1) (a) to read as follows, “Public Works Projects Bidding After October 1, 2014, the General Contractor shall secure and pay for building permit fee required under Administrative Rule 170X-8 of The Alabama Division of Construction Management. See attached Permit Fee Calculation

Worksheet."

c. Paragraph A - Add subparagraph (3) to read as follows, "Alabama laws require that, as a condition for the award of a contract by a school board to a business entity or employer with one or more employees working in Alabama, the business entity or employer must provide documentation of enrollment in the E-Verify program. During the performance of the contract, the business entity or employer shall participate in the E-Verify program and shall verify every employee that is required to be verified according to the applicable federal rules and regulations. The contractor's E-Verify Memorandum of Understanding must be included with the bid. If you do not believe these requirements are applicable to your entity, include an explanation justifying such exemption. An entity can obtain the E-Verify Memorandum of Understanding upon completion in the E-Verify enrollment process located at the federal web site www.uscis.gov/everify. The Alabama Department of Homeland Security (http://immigration.alabama.gov) has also established an E-Verify employer agent account for any business entity or employer with 25 or fewer employees that will provide a participating business entity or employer with the required documentation of enrollment in the E-Verify program. An Employer Identification Number (EIN), also known as a Federal Tax Identification Number, is required to enroll in E-Verify or to establish an E-Verify employer agent account."

d. Paragraph B - Taxes – replace this paragraph in its entirety with the following, "Taxes: Notice of Sales & Use Tax Exemption: Materials incorporated into the Work are exempt from sales and use tax pursuant to Alabama Act No. 2013-205 (effective October 1, 2013). The Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, and Business Tax Division of the Alabama Department of Revenue regarding certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors. The Owner shall not consider claims for additional costs resultant of the contractor's, or its subcontractors', failure to comply with such rules and regulations."

6. Article 49 - Liquidated Damages: Add Article 49 in "Appendix B" attached hereto.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

Revised December 2021

ALABAMA DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management

www.dcm.alabama.gov, 334-242-4082, inspections@realproperty.alabama.gov

Department Use Only
Invoice # _____
Date Paid _____
Confirmation # _____

PERMIT FEE & PERMIT RE-INSPECTION FEE CALCULATON WORKSHEET

DCM (BC) # _____ Date _____

Project Name; Owner/Architect/Engineer Project # & Phase/Package # _____

_____

Owner Entity Name _____

Architect/Engineer Firm Name _____

Contractor Company Name _____

Select only ONE of the following:

☐ Basic Permit Fee. Fee is based on awarded contract sum.

☐ Permit Re-Inspection Flat Fee.

Awarded Contract Sum: _____

Email address(es) for Payment Receipt: _____

BASIC PERMIT FEE CALCULATION:

Awarded Contract Sum is less than $1,000: N/A

Awarded Contract Sum is $1,001 - $50,000:

Contract Sum or Shelter Estimate less $1,000= _____/1,000 x $5.00=_____+$15.00=_____

Awarded Contract Sum is $50,001 - $100,000:

Contract Sum or Shelter Estimate less $50,000= _____/1,000 x $4.00=_____+$260.00=_____

Awarded Contract Sum is $100,001 - $500,000:

Contract Sum or Shelter Estimate less $100,000= _____/1,000 x $3.00=_____+$460.00=_____

Awarded Contract Sum is $500,001 and up:

Contract Sum or Shelter Estimate less $500,000= _____/1,000 x $2.00=_____+$1,660.00=_____

PERMIT RE-INSPECTION FEE:

Flat fee of $1,500.00 per occurrence

TOTAL DUE: _____

Basic Permit Fee: Covers all required pre-construction conferences, construction inspections and certificate of substantial completion issuance by the DCM Inspector. This fee is due when a construction contract or self-performance letter is received by DCM and must be paid before the required Pre-Construction Conference is scheduled with the DCM Inspector.

Permit Re-Inspection Fee: May be charged if (A) the contractor has not completed the work required for the particular inspection as detailed in DCM Form B-8: Pre-Construction Conference Checklist, or (B) the inspection is canceled or rescheduled without the required minimum 48 hours notice to all parties.

Make check payable to: "Finance - Construction Management," include the DCM (BC) Project # on the check and attach the fee worksheet. Mail payment to: Finance - Construction Management, P.O. Box 301150, Montgomery, AL 36130-1150.

State agency inter-fund transfer and payments using Public School and College Authority (PSCA) funds: contact Jennie Jones at 334-242-4808 or jennie.jones@realproperty.alabama.gov.

Fees may be paid online at www.dcm.alabama.gov (in which case a completed fee worksheet is not required).

The Basic Permit Fee is subject to Final Reconciliation of Fees at the end of construction.

APPENDIX A

SUPPLEMENTARY CONDITIONS OF THE CONTRACT - WEATHER DELAYS

EXTENSIONS OF CONTRACT TIME

Extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard baseline for the month.

STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

Based on weather data available from the National Oceanic and Atmospheric Administration a Standard Baseline of average climatic range for North Alabama has been determined.

Standard Baseline shall be regarded as the normal and anticipatable number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

Standard Baseline for precipitation is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
06	09	08	08	07	06	07	08	03	05	05	08

Standard Baseline for temperature is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
06	02	01	00	00	00	00	00	00	00	01	02

ADVERSE WEATHER AND WEATHER DELAY DAYS

Adverse Weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours:

1. Precipitation (rain, snow, or ice) in excess of one-tenth (0.10”) liquid measure.

2. Temperatures which do not rise above 32 degrees F by 10:00 a.m.

3. Temperatures which do not rise above that specified by day’s construction activity by 10:00 a.m., if any is specified.

4. Sustained wind in excess of twenty-five (25) m.p.h.

5. Standing snow in excess of one inch (1.00”)

Adverse Weather may include, if appropriate, “dry-out” or “mud” days when all the following conditions are met:

1. For rain days above the standard baseline.

2. Only if there is a hindrance to site access or sitework, such as excavation backfill, and footings.

3. At a rate no greater than 1 make-up day for each day of consecutive days or rain beyond the standard baseline that totals 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Designer.

A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day, including a weekend day or holiday.

REPORTING OF WEATHER DELAYS

Contractor will provide written notice to the Architect, and Construction Manager, by fax, of a day claimed as a potential basis for delay. Notice of a potential basis for delay must be received by the Architect by 9:00 a.m. on the day immediately following the day claimed. At the end of the month the total days claimed will be compared to the Standard Baseline. Bad weather days exceeding the days indicated on the Standard Baseline will be granted as an extension of time.

END OF APPENDIX A

APPENDIX B

SUPPLEMENTARY CONDITIONS OF THE CONTRACT - ARTICLE 49

49. LIQUIDATED DAMAGES:

A. The Substantial Completion date of this project is critical due to owner occupancy. Delays in the completion of the work as provided for in the Contract Documents will cause undue expense and hardship for the Owner.

B. Refer to Section 01 10 00 Summary for contract time.

C. LIQUIDATED DAMAGES:

1. A charge of $500.00 per day will be made against the General Contractor for not meeting the Date of Substantial Completion.

2. The amount of the total charges shall be deducted by the Owner from the Final estimate and shall be retained by the Owner out of moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, it being mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

D. Liquidated damages will be processed by change order to the contract price.

END OF APPENDIX C

APPENDIX D

SUPPLEMENTARY CONDITIONS OF THE CONTRACT – ARTICLE 29

29. SCHEDULE OF VALUES:

A. In accordance with the General Conditions of the Contract, Article 29, Paragraph B, the Contractor shall submit for approval a Schedule of Values as shown below.

No.	*Divisions of Work*
1	*Bonds, Insurance & Permits*
2	*General Conditions*
3	*Allowances*
4	*Grading & Earthwork*
5	*Storm Drainage*
8	*Paving, Curb & Gutter*
7	*Conc. Walks / Pads / Aprons*
8	*Site Utilities*
9	*Demolition*
10	*Concrete Footings / Slabs*
11	*Struct. Steel / Misc. Metals*
12	*Rough Carpentry*
13	*Thermal & Moisture*
14	*Doors & Frames*

No.	*Divisions of Work*
15	*Hardware*
16	*Overhead/Roll-Up Doors*
17	*Drywall / Acoustical*
18	*Painting*
19	*Specialties*
20	*Misc. Equip. / Furnishings*
21	*Pre-Engineered Building*
22	*Canopies*
23	*Plumbing*
24	*HVAC*
25	*Electrical*
26	*Fire Alarm*
27	*Phone / Data / Security*

END OF SECTION

Do not staple this form and/or attachments; use clips.

GENERAL CONTRACTOR'S ROOFING GUARANTEE

DCM (BC) Project No. _____

Project Name & Address	Project Owner Entity(ies) Name(s) & Address(es)

General Contractor's Company Name, Address, & Telephone Number	**EFFECTIVE DATES OF GUARANTEE**
	Date of Acceptance:
	Date of Expiration:

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturers recommendations.

2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.

3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.

B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.

C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.

D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.

E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

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

_____
General Contractor's Authorized Signature

_____
Typed Name and Title

DCM Form C-10
Revised July 2022

DCM (BC) No. _____

PSCA Projects: PSCA No. _____

Application No. _____

Date: _____

APPLICATION and CERTIFICATE for PAYMENT

Attach DCM Form C-10SOV: Schedule of Values

TO OWNER: Entity Name: Address:	PROJECT:
FROM CONTRACTOR: Company Name & Address, which must exactly match co. name & payment address spelling as registered in State of AL Accounting & Resource System (STAARS) or AL Buys to avoid rejection: STAARS or AL Buys Vendor #:	ARCHITECT / ENGINEER: Firm Name: Address:

A. Total Original Contract	$
B. Fully Executed (fully signed) Change Order(s) Numbers __ through __	+$ _____
C. Total Contract To Date	$

1. Work Completed to Date per attached Schedule of Values *(Form C-10SOV's Column F Total)*		$
2. Materials Presently Stored *(When this amount is greater than $0.00, attach Form C-10SM: Inventory of Stored Materials, or similar list)*		+$ _____
3. Total Work Completed to Date & Materials Presently Stored *(_____% of Contract To Date)*		$
4. Less Retainage *(If Total Work Completed to Date & Materials Presently Stored (#3) is less than or equal to 50% of Total Contract to Date (C), Retainage = #3 x 0.05. Once #3 exceeds 50% of C and up until project is complete, Retainage = C x 0.025. $0 is retained on final payment application, see last bullet point below Instructions.)*	Final pay app? ☐ Yes.	−$ _____
5. Total Due		$
6. Less Total Previous Payments Billed *(Must exactly match #5 Total Due from previous payment application. # 6 is $0.00 if there is no previous payment application)*		−$ _____
7. Balance Due This Estimate		$

CONTRACTOR'S CERTIFICATION

The undersigned Contractor certifies that to the best of his knowledge, information, and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payments were issued and payments received from the Owner and that current payment shown herein has not yet been received.

By: _____ Date: _____
Contractor's Signature

Name & Title _____

Sworn and subscribed before me this _____ day of _____
Day Month, Year

Seal:

_____
Notary Public's Signature

ARCHITECT'S / ENGINEER'S CERTIFICATION

In accordance with the Contract Documents, the Architect/ Engineer certifies to the Owner that, to the best of the Architect's/ Engineer's knowledge and belief, the Work has progressed to the point indicated herein, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the amount approved.

By _____
Architect's / Engineer's Signature

Name & Title _____

Date _____

INSTRUCTIONS

- PSCA-funded projects, and State Agency-owned projects: Two copies of pay. app., each with original signatures and all attachments required.
- Date of first payment application cannot precede the Notice to Proceed's Begin Date.
- Pay. app. must exactly match an attached DCM Form C-10SOV: Schedule of Values.
- A change order must be fully executed before inclusion on a payment application.
- Contractor's signature date cannot precede the payment application date.
- Contractor and Notary signee dates must match.
- Progress schedules must be included with non-final payment applications.
- One payment application per month may be submitted.
- On a final payment application, the following is required for release of retainage: all change orders must be fully executed (signed by all parties and approval authorities) and included in B., the Certificate of Substantial Completion for entire work is fully executed, and all other close-out requirements per General Conditions Article 34 are completed.

APPROVAL

_____
Owner Entity

By _____
Signature

Name & Title _____

Date _____

INVENTORY OF STORED MATERIALS

DCM Form C-10SM
Revised October 2021

Project:	DCM (BC) No.:
	PSCA No, if any:
Contractor Company:	For Estimate No.:
	For Period Ending:

A	B	C	D	E
Description	**Materials Stored Last Period**	**Materials Purchased This Period (period noted above)**	**Materials Used This Period (period noted above)**	**Materials Presently Stored (B + C - D)**
TOTALS:				

Instructions :

· This Form C-10SM must be submitted as part of the payment application documentation when a Materials Presently Stored amount of anything greater than $0 is noted on line 2 of DCM Form C-10: Application and Certificate for Payment.

· Receipts must be provided as attachments to this form C-10SM for all amounts placed in Column C: Materials Purchased This Period.

· The total $ amount of this Form C-10SM's column E: Materials Presently Stored must match both Form C-10's line 2: Materials Presently Stored, and Form C-10SOV: Schedule of Values' total $ amount of Column G: Materials Presently Stored.

· The $ amounts in this current Form C-10SM's Column D: Materials Used This Period are amounts that must all be included in the current payment application's Form C-10SOV's Column E: Work Completed This Period.

· The $ amounts in this current Form C-10SM's Column E: Materials Presently Stored are the amounts that must be listed in the next payment application's Form C-10SM's Column B: Materials Stored Last Period.

SCHEDULE OF VALUES (SOV)

DCM Form C-10SOV
Revised October 2021

Project:	DCM (BC) Project Number:
	PSCA Project Number, if any:
Contractor Company:	Application Number:
	Application Date:
	Period From: / Period To:

A	B	C	D	E	F	G	H	I	J
Item No.	Description of Work	Scheduled Value (including fully executed [signed by all parties] change order amounts)	Work Completed: Work Previously Completed (Previous pay app SOV's column F. D is $0 if this SOV is for first pay app.)	Work Completed: Work Completed This Period (Period as noted above)	Total Work Completed to Date (This application SOV's D + E)	Materials Presently Stored (G total greater than $0 must match C-10SM's column E total. This SOV's G amounts are not in this SOV's D nor E amounts.)	Total Work Completed to Date & Materials Presently Stored (This SOV's F + G)	Percent of Contract Completed to Date (This SOV's H / C)	Retainage (This column's Total's cell formula calculates the applicable variable rate)
1.					$ -		$ -		Retainage Variable Rate:
2.					$ -		$ -		
3.					$ -		$ -		
4.					$ -		$ -		If Total Work Completed to Date & Materials Presently Stored (H) is less than or equal to 50% of Total Scheduled Value (C), Retainage = H x 0.05.
5.					$ -		$ -		
6.					$ -		$ -		
7.					$ -		$ -		
8.					$ -		$ -		
9.					$ -		$ -		
10.					$ -		$ -		
11.					$ -		$ -		
12.					$ -		$ -		
13.					$ -		$ -		
14.					$ -		$ -		
15.					$ -		$ -		Once H exceeds 50% of C and up until project is complete, Retainage = C x 0.025.
16.					$ -		$ -		
17.					$ -		$ -		
18.					$ -		$ -		
19.					$ -		$ -		
20.					$ -		$ -		
21.					$ -		$ -		There will be no retainage on final payment application.
22.					$ -		$ -		
23.					$ -		$ -		
24.					$ -		$ -		
25.					$ -		$ -		
	TOTALS:	$ -	$ -	$ -	$ -	$ -	$ -		$ -
This pay app SOV's column totals must match amounts in this pay app Form C-10 per the following indicated Form C-10 line #s:		C.	None	None	1.	2.	3.	3.	4.

Note: If this SOV's column G: Materials Presently Stored includes any amounts other than $0, then DCM Form C-10SM: Inventory of Stored Materials with back-up receipts must be submitted as part of the payment application documentation.

FINAL PAYMENT CHECKLIST (FPC)

To be completed by the Architect/Engineer and submitted to DCM for review; applicable only to state agencies, partially or fully PSCA-funded and other bond-funded projects (exception: Alabama Community College System (ACCS) PSCA-funded projects with Notice-To-Proceeds issued after July 31, 2021). Two copies of the FPC are required. Each copy of the FPC shall include all attachments including the Contractor's Application for Final Payment.

(For further guidance refer to Article 34/Final Payment of DCM Form C-8: General Conditions of the Contract.)

PROJECT:	**DCM (BC) No.** _____ **PSCA No.** _____ (If applicable)

YES	N/A	Select "YES" or "N/A" as applicable.
☐	☐	Application and Certificate for Final Payment, DCM Form C-10: Attach one copy to FPC. The application must include original signatures of all parties and include all application attachments.
☐		Certificate of Substantial Completion, DCM Form C-13: Attach one fully-executed copy to FPC.
☐		Advertisement for Completion, DCM Form C-14: Attach one copy of the affidavit of publication (including the advertisement) to the FPC.
☐	☐	Contractor's Affidavit of Payment of Debts & Claims, DCM Form C-18: Attach one copy to FPC.
☐	☐	Contractor's Affidavit of Release of Liens, if required by Owner, DCM Form C-19: Attach one copy to the FPC.
☐	☐	Consent of Surety to Final Payment, if any, To Contractor, DCM Form C-20: Consent is required for projects with P&P Bonds. Original has been delivered to Owner. Attach one copy to FPC.
☐	☐	General Contractor's Roofing Guarantee, DCM Form C-9, and Other Specified Roofing Guarantees, if any: Attached to Certificate of Substantial Completion.
☐	☐	Contractor's One-Year Warranty: Original has been delivered to the Owner. Attach one copy to the FPC.
☐	☐	Other Warranties: All other specified original warranties has been delivered to the Owner. Attach one copy to the FPC.
☐	☐	Record Documents: Specified "As-built" plans and specifications have been delivered to the Owner.
☐		O & M Manuals: Specified instructions and O&M Manuals have been delivered to the Owner.
☐	☐	Time Extension: Over-run of Contract Time has been reconciled by: ☐ Change Order ☐ Liquidated Damages ☐ Attached explanation
☐	☐	Additional Documents or Explanations which are attached:

Submitted By: _____
Architectural / Engineering Firm

_____ Signature | _____ Printed Name and Title | _____ Date

Final Reconciliation of Fees: Between the final change order execution and the year-end inspection, report the final project cost to https://appengine.egov.com/apps/al/dcm-fees (back-up is not needed unless requested by DCM). DCM will then email a Final Reconciliation of Fees Statement to the Owner. If the Final Statement shows a net payment is owed to DCM, that amount must be paid prior to scheduling the year-end inspection. If the Final Statement shows a net refund is owed then a check will be mailed to the Owner.

SAMPLE PROGRESS SCHEDULE & REPORT	CONTRACTOR (Contractor may use own form in lieu of Form C-11):	DATE OF REPORT:
DCM (BC) No.:		PROCEED DATE:
PSCA projects: PSCA No.:		
PROJECT:	ARCHITECT/ENGINEER:	PROJECTED COMPLETION DATE:

	WORK DIVISION	%	AMOUNT													
1.	GENERAL REQUIREMENTS															
2.	SITEWORK															
3.	CONCRETE															
4.	MASONRY															
5.	METALS															
6.	WOOD AND PLASTIC															100%
7.	THERMAL AND MOISTURE PROTECTION															90%
8.	DOORS AND WINDOWS															80%
9.	FINISHES															70%
10.	SPECIALTIES															60%
11.	EQUIPMENT															50%
12.	FURNISHINGS															40%
13.	SPECIAL CONSTRUCTION															30%
14.	CONVEYING SYSTEMS															20%
15.	MECHANICAL															10%
16.	ELECTRICAL															0%
TOTAL ORIG. CONTRACT		100%														
ANTICIPATED DRAW IN $1,000																
ACTUAL DRAW IN $1,000																

LEGEND: ANTICIPATED ACTIVITY ACTUAL ACTIVITY ANTICIPATED CASH FLOW ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS SCHEDULED OVER 12 MONTHS.

DCM Form C-11 August 2021

CONTRACT CHANGE ORDER

Change Order No. _____ **Date** _____ **DCM (BC) No.** _____

TO: (*Contractor*) Co. Name: Address:	**PROJECT:**

TERMS: You are hereby authorized, subject to the provisions of your Contract for this project, to make the following changes thereto in accordance with your proposal(s) dated _____

_____.

FURNISH the necessary labor, materials, and equipment to (*Description of work to be done or changes to be made. If the description is continued in an attachment, identify the attachment below.*):

Description continued from Page 1:

ORIGINAL CONTRACT SUM $ _____

NET TOTAL OF PREVIOUS CHANGE ORDERS $ _____

PREVIOUS REVISED CONTRACT SUM $ _____

THIS CHANGE ORDER WILL ☐ **INCREASE** ☐ **DECREASE THE CONTRACT SUM BY** $ _____

REVISED CONTRACT SUM, INCLUDING THIS CHANGE ORDER $ _____

EXTENSION OF TIME resulting from this Change Order ☐ None *or* _____ Calendar days.

The Owner does hereby certify that this Change Order was executed in accordance with the provisions of Title 39, Code of Alabama, 1975, as amended.

_____
Architectural/Engineering Firm

Recommended By _____

Name & Title _____

APPROVAL

ALABAMA STATE DEPARTMENT OF EDUCATION (SDE)

(Required for locally-funded, SDE projects.)

By _____ Date: _____
State Superintendent of Education

CONTRACTING PARTIES

_____
Contractor Company

By _____

Name & Title _____

_____
Awarding Authority/Owner Entity

By _____

Name & Title _____

CONSENT OF SURETY (for additive $ change orders only)

_____
Surety Company

By _____
(Attach current Power of Attorney)

Name & Title _____

Review/Signature flow: Architect/Engineer (prepare documents) > Contractor (review and sign) (> Surety for additive $ change orders only [sign]) > Architect/Engineer (review and sign) > Owner (review and sign) > SDE (review, sign, distribute the fully executed Change Order to all parties and forward a copy to the Alabama Division of Construction Management [DCM]). Note: DCM does not sign fully locally-funded SDE project contract documents.

TO: **Alabama Department of Finance**
Real Property Management
Division of Construction Management
770 Washington Avenue, Suite 444
Montgomery, Alabama 36104
(334) 242-4082 FAX (334) 242-4182

CHANGE ORDER JUSTIFICATION

Purpose and instructions on next page.
Do not staple this form and/or attachments; use clips.

Change Order No. _____

Date: _____

DCM (BC) No. _____

(A)

PROJECT NAME & LOCATION:	OWNER ENTITY NAME & ADDRESS:
CONTRACTOR COMPANY NAME & ADDRESS:	ARCHITECTURAL / ENGINEERING FIRM NAME & ADDRESS:

(B) **DESCRIPTION OF PROPOSED CHANGE(S):** **ATTACH CONTRACTOR'S DETAILED COST PROPOSAL(s)**

AMOUNT: ☐ **ADD** ☐ **DEDUCT $_____** **TIME EXTENSION: _____ CALENDAR DAYS**

(C)

ORIGINAL CONTRACT AMOUNT		PREVIOUS C.O.'s _____ THRU _____		CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER
$_____	+	$_____	=	$_____

(D) **JUSTIFICATION FOR NEED OF CHANGE(S):**

(E) **JUSTIFICATION OF CHANGE ORDER vs. COMPETITIVE BID:**

(F) **ARCHITECT / ENGINEER'S EVALUATION OF PROPOSED COST:**

(G)

CHANGE ORDER RECOMMENDED	CHANGE ORDER JUSTIFIED AND APPROVED
_____ ARCHITECTURAL / ENGINEERING FIRM NAME	_____ LOCAL OWNER ENTITY NAME
By: _____ ARCHITECT / ENGINEER'S SIGNATURE	By: _____ OWNER'S SIGNATURE
By: _____ OWNER'S PROJECT REPRESENTATIVE'S SIGNATURE	By: _____ OWNER'S LEGAL COUNSEL'S SIGNATURE

CHANGE ORDER JUSTIFICATION: PURPOSE and INSTRUCTIONS

PURPOSE

The awarding of work through an existing contract may potentially conflict with, or violate, the "Competitive Bid Laws" of the State of Alabama. **The determination of legality of Change Orders rests with the Awarding Authority and its legal advisor.** In a June 15, 1979, Opinion, the Office of the Attorney General offered guidelines for making such determinations in conjunction with considering the facts and merits of each situation. The purpose of the CHANGE ORDER JUSTIFICATION is to provide a means through which the Awarding Authority considers these guidelines and the intent of the "Competitive Bid Laws" when authorizing Change Orders. Pursuant to these guidelines, the following types of changes meet the criteria for awarding work through Change Orders in lieu of through the Competitive Bid process:

I. Minor Changes for a monetary value less than required for competitive bidding.

II. Changes for matters relatively minor and incidental to the original contract necessitated by unforeseeable circumstances arising during the course of the work.

III. Emergencies arising during the course of the work of the contract.

IV. Bid alternates provided for in the original bidding where there is no difference in price of the change order from the original best bid on the alternate.

V. Changes of relatively minor items not contemplated when the plans and specifications were prepared and the project was bid which are in the public interest and which do not exceed 10% of the contract price.

Under these guidelines the cumulative total of Change Orders, including any negotiations to bring the original contract price within the funds available, would become questionable if the total of such changes and negotiations exceed 10% of the original contract price. These guidelines are not intended to interfere with the Awarding Authority's good faith discretion to respond to specific situations in the public's best interest. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign the Change Order Justification prior to submission to the Division of Construction Management (DCM).

INSTRUCTIONS

The CHANGE ORDER JUSTIFICATION is to be prepared by the design professional, who has evaluated the fairness and reasonableness of the proposed cost of the change(s) and recommends that the proposed Change Order be executed. The fully executed Form B-11: CHANGE ORDER JUSTIFICATION must accompany the proposed DCM Form C-12: Change Order. Instructions for completing the B-11 form are:

1. Insert the proposed Change Order Number, date of the Justification, and DCM (BC) Project Number in the spaces provided in the upper right-hand corner.

2. **Section (A):** Insert the complete name and address of the PROJECT, OWNER, CONTRACTOR, AND ARCHITECT/ENGINEER.

3. **Section (B)**: Provide a complete description of the proposed changes in work, referring to and attaching revised specifications and/or drawings as appropriate. An attachment may be used if additional space is needed, but insert the proposed amount and time extension of the change(s) in the spaces provided. **Attached a copy of the contractor's detailed cost proposal.**

4. **Section (C**): Insert the Original Contract amount, the net increase or decrease of previous Change Orders, and the Current Contract amount (preceding the currently proposed Change Order).

5. **Section (D):** Explain why it is necessary, or in the public's interest, to make the proposed change(s) to the Work.

6. **Section (E)**: Explain why award of the changed work to the existing contractor instead of awarding the work under the competitive bid process is justified.

7. **Section (F)**: The design professional must state his evaluation of the reasonableness and fairness of the proposed costs based upon his review of the contractor's proposal.

8. **Section (G)**: The design professional must recommend the Change Order to the Owner by signing the document; the Owner may require such recommendation from other individuals. The Owner must sign the document indicating that they believe change order action in lieu of the competitive bid process is justified for the proposed change(s). **Review of the matter and signing of the document by the Owner's legal counsel is highly recommended. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign the Change Order Justification prior to submission to DCM.**

Alabama Department of Finance
Real Property Management
Division of Construction Management
770 Washington Avenue, Suite 444
Montgomery, Alabama 36104
(334) 242-4082 (phone)

DCM Form B-12
Revised July 2022

CHANGE ORDER CHECKLIST

For use with DCM Form C-12 and DCM Form 9-J

WHICH FORM DO YOU USE?

Use **DCM Form C-12** for contracts of state agencies and departments and State Department of Education (SDE) projects. Also use for ACCS projects with Notice-to-Proceeds issued prior to August 1, 2021.
Use **DCM Form 9-J** for contracts of projects partially or fully Public School and College Authority (PSCA)-funded, except for ACCS projects with Notice-To-Proceeds issued after July 31, 2021. Include a completed **DCM Form B-11:** Change Order Justification with each copy of either DCM Forms C-12 or 9-J.

Verify that the following information is inserted in the spaces provided on the CONTRACT CHANGE ORDER form, or attached to the form where attachments are noted to be acceptable or obviously necessary. Do not staple forms; use clips.

1.	**CHANGE ORDER NUMBER:** Insert current change order number.
2.	**DATE:** Insert date.
3.	**DCM (BC) PROJECT NUMBER:** Insert DCM Project Number in the block provided at top of document.
4.	**CONTRACTOR** Insert name and address of the Contractor, exactly as they appear on the Construction Contract.
5.	**NAME OF PROJECT:** Under "Project", insert the complete name of the project as identified in the bid documents. If using DCM Form 9-J, insert the PSCA Project Number in the space provided.
6.	**CONTRACTOR'S PROPOSALS:** Under "TERMS", identify the change order proposals submitted by the contractor that are being addressed by the Contract Change Order. Identify these proposals by inserting their dates.
7.	**DESCRIPTION OF THE CHANGE(S) IN WORK:** Fully describe the change or changes to the original contract work for which the Construction Contract is being modified. This description should be written so that a reader of the document who is not directly involved in the project can understand what is being changed. If the space provided on the form is inadequate for such a description, use attachments and cite them.
8.	**CONTRACT AND CHANGE ORDER AMOUNTS:** Insert the applicable dollar amounts to record the original contract sum, change orders, and the currently revised contract sum.
9.	**EXTENSION OF TIME:** If the Contract Time is being extended by the Contract Change Order, insert appropriate number of **calendar days** in the space provided. If the Contract Time is not being extended, insert "NONE".
10.	**RESPONSIBILITY FOR CHANGE ORDER FUNDING - DCM Form 9-J ONLY:** The authority responsible for funding the change order is to be identified in the following sentence in the form,: "The amount of this Change Order will be the responsibility of _____." Insert whichever is appropriate: (1) "PSCA", (2) name of LEA, or (3) "PSCA" and name of LEA.
11.	**SIGNATURES:** The signature spaces for State Agency, PSCA and fully locally-funded Alabama Community College System projects are different from each other. Download the appropriate document per Owner/project type from www.dcm.alabama.gov/forms.aspx. Before submitting a Contract Change Order to DCM, the document must be signed by the contractor, surety (for additive change orders only), design professional and owner (local owner or using agency). Signature by the surety is not necessary on deductive change orders or change orders involving only extensions of time. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign DCM Form B-11: Change Order Justification.
12.	**ATTACHMENTS:** To each of the three (3) copies (with original signatures) of the Contract Change Order form, attach with clips (do not staple): a. Contractor's change order proposals and/or invoices providing a detailed breakdown of change order costs. General Contractors (GC) must include subcontractors' (sub) quotes as backup. All GC and sub quotes must be broken down by labor (hours and rates), materials including quantities and unit prices (with receipts or quotes attached), equipment whether rented or owned (with receipts or quotes attached), and Overhead & Profit (OH&P). 1. Total OH&P can be a maximum of 25% divided between GC and subs; GC can have a maximum of 15% OH&P (in which case a sub could have up to 10% OH&P). See General Conditions- Article #19. 2. Sales tax cannot be included in change orders. 3. Deductive change orders also require backup including breakdown of labor and material, and must also deduct OH&P if included in original bid. Include specification section regarding allowances. b. **POWER OF ATTORNEY** for the individual signing the Contract Change Order for the surety. c. **DCM Form B-11, CHANGE ORDER JUSTIFICATION:** completed and signed by the design professional and owner.

TO: **Alabama Department of Finance**
Real Property Management
Division of Construction Management
770 Washington Avenue, Suite 444
Montgomery, AL 36130-1150
(334) 242-4082 FAX (334) 242-4182

CERTIFICATE OF SUBSTANTIAL COMPLETION

Do not staple this form and/or attachments; use clips.
Print single-sided; do not submit double-side printed documents.

ROUTING PROCEDURES *ON NEXT PAGE*

DCM (BC) No. _____

OWNER ENTITY NAME AND ADDRESS:	**ARCHITECTURAL / ENGINEERING FIRM NAME AND ADDRESS:**
Email to receive executed copy: _____	Email to receive executed copy: _____
CONTRACTOR COMPANY NAME AND ADDRESS:	**BONDING COMPANY NAME AND ADDRESS:**
Email to receive executed copy: _____	Email to receive executed copy: _____
PROJECT:	

Substantial Completion has been achieved for ☐ the entire Work ☐ the following portion of the Work:

_____

_____.

The **Date of Substantial Completion** of the Work covered by this certificate is established to be _____.

"Substantial Completion" means the designated Work is sufficiently complete, in accordance with the Contract Documents, such that the Owner may occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work. The Date of Substantial Completion is the date upon which all warranties for the designated Work commence, unless otherwise agreed and recorded herein.

Punch List: A _____ page list of items to be completed or corrected prior to the Owner's approval of Final Payment is attached hereto, but does not alter the Contractor's responsibility to complete or correct all Work in full compliance with the Contract Documents. The Contractor shall complete or correct all items on the attached list, ready for re-inspection for Final Acceptance, within 30 days after the above Date of Substantial Completion, unless another date is stated here: _____.
If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item.

Only <u>one</u> (1) originally executed substantial completion form shall be routed for signature. DCM office will mail the fully-executed original to the Owner and email copies to all parties.

RECOMMENDED BY *(signature and email address required)***:**	
ARCHITECT/ENGINEER: _____	DATE: _____
CONTRACTING PARTIES:	
CONTRACTOR: _____	DATE: _____
OWNER: _____	DATE: _____
_____	DATE: _____
APPROVALS:	
DCM INSPECTOR: _____	DATE: _____
DCM CHIEF INSPECTOR: _____	DATE: _____
DCM DIRECTOR: _____	DATE: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION ROUTING PROCEDURE

Only one (1) originally executed substantial completion form shall be routed for signature. DCM office will mail the fully-executed original to the owner and email copies to all parties.

ARCHITECT/ENGINEER: Sign and date document, then mail it to Contractor. Provide Owner with DCM Inspector's name & field office address; territories and addresses are available at www.dcm.alabama.gov/staff.aspx.

CONTRACTOR: Sign and date document, then mail it to Owner.

OWNER: Sign and date document, then mail it to DCM Inspector's field office address; DCM Inspector territories and addresses are available at www.dcm.alabama.gov/staff.aspx.

DCM INSPECTOR: Sign and date document, then mail it to DCM Montgomery office.

DCM OFFICE: After review and signature/date by DCM Chief Inspector and DCM Director, DCM office will mail the fully-executed original document to Owner and will email copies to all parties.

NOTICE

THE EXECUTED "GENERAL CONTRACTOR'S ROOFING GUARANTEE" (DCM Form C-9) AND ANY OTHER ROOFING WARRANTY REQUIRED BY THE CONTRACT MUST ACCOMPANY THIS CERTIFICATE TO OBTAIN DCM APPROVAL.

SAMPLE FORM OF ADVERTISEMENT FOR COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given

that _____,
(*Contractor Company Name*)
Contractor, has completed the Contract for ☐(Construction) ☐(Renovation) ☐(Alteration) ☐(Equipment) ☐(Improvement) of (*Name of Project*):

at _____

(*Insert location data in County or City*)
for the State of Alabama and the (County) (City) of _____, Owner(s), and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify

_____

_____
(*Architect / Engineer*)

_____
(Contractor)

_____
(Business Address)

NOTE: This notice must be run once a week for four successive weeks for projects exceeding $50,000.00. For projects of $50,000.00 or less, run one time only. A copy of the publisher's affidavit of publication (including a copy of the advertisement) shall be submitted by the Contractor to the Design Professional for inclusion with DCM Form B-13: Final Payment Checklist for state agencies, PSCA-funded and other bond-funded projects.

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Payment of Debts and Claims

To Owner (*Entity name and address*)**:**	**Project** (*Same as appears in the Construction Contract*)**:**

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. DCM Form C-20, Consent of Surety to Final Payment, may be used for this purpose.

   Indicate attachment: ☐ Yes ☐ No

The following supporting document should be attached hereto if required by the Owner:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.
3. Contractor's Affidavit of Release of Liens, DCM Form C-19.

Contractor (*Insert company name and address*)**:**

By:_____
Signature of authorized representative

_____
Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____
Notary Public's Signature

My commission expires: _____

Seal:

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Release of Liens

To Owner (*Entity name and address*)**:**	**Project** (*Same as appears in the Construction Contract*)**:**

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Construction Contract referenced above.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.

Contractor (*Insert company name and address*)**:**

By: _____
Signature of authorized representative

_____
Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____
Notary Public's Signature

My commission expires: _____

Seal:

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Surety's Bond Number: _____

CONSENT OF SURETY TO FINAL PAYMENT

To Owner (*Entity name and address):*	**Project** (*Same as appears in the Construction Contract*)**:**

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

Surety (*Insert name and address of Surety*)

on bond of

Contractor (*Insert name and address of Contractor*)

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to

Owner (*Insert name and address of Entity*)**:**

as set forth in said Surety's bond.

SIGNED AND SEALED this _____ day of _____, _____.

SURETY:

_____ Seal:
Company Name

By _____
Signature of Authorized Representative

_____
Printed Name and Title

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each of the original forms to be attached to each of the four (4) final payment forms.

Alabama Department of Finance
Real Property Management
Division of Construction Management
770 Washington Avenue, Suite 444
Montgomery, AL 36104
(334) 242-4082, inspections@realproperty.alabama.gov

DCM Form B-8
November 2021

PRE-CONSTRUCTION CONFERENCE CHECKLIST

The following are recommended topics to be covered during the required Pre-Construction Conference. Contact the DCM Project Inspector at least fourteen (14) days prior to scheduling the conference.

**Item shall be discussed while Owner is present.*

☐	*1. Name and relationship to job of local Owner personnel
☐	2. Public officials involved
☐	3. Names of architect/engineer personnel involved
☐	4. Provide e-mail addresses on Pre-Construction Sign-in sheet
☐	5. Construction sets of plans available to contractor
☐	6. Verify alternates accepted, etc.
☐	7. Approved list of sub-contractors
☐	8. Approved cost breakdown & Progress Schedule
☐	9. Method of approving monthly payment requests
☐	10. Change Orders - Documentation - no prior work, **unless authorized in writing**
☐	11. Shop drawings, time to process
☐	12. Advance notice for required inspections The contractor will notify the architect by email of the date the project will be ready for an inspection by the Division of Construction Management. Inspections must be requested 14 days in advance. When the DCM Inspector confirms the inspection date and time, the architect will send an email confirming the inspection date and time to all parties as well as a copy to inspections@realproperty.alabama.gov. Cancellations of any scheduled inspection must be received in writing no later than 48 hours prior to the scheduled inspection. If the inspection is canceled, it will be rescheduled subject to the DCM Inspector's availability. Cancellations received less than 48 hours in advance shall incur a $1,500.00 re-inspection fee. If the contractor is not ready for the scheduled inspection he shall incur a $1,500.00 re-inspection fee.
☐	13. Inspection Minimum Requirements The following minimum requirements listed below are provided to aid the contractors and architect in determining if a project is ready for a required inspection. Pre-Construction Conference: Required Attendees: Contractor, Owner, Architect, Major Subs • Fully-executed construction contract and Notice to Proceed • Verification of payment of permit fee • Contractor's statement of responsibility and quality assurance plan (storm shelter) • Fire alarm contractor and fire sprinkler contractor certification (from State Fire Marshal) • ADEM permit, if more than one acre of land is disturbed Pre-Construction Conference for Storm Shelter: Required Attendees: Contractor, Owner, Architect, Structural Engineer, Major Subs, Special Inspections Representative • The completed and signed DCM Form C-17: Contractor's Statement of Responsibility for Construction of Tornado Storm Shelter (Hurricane Shelter Where Applicable) along with the required Quality Assurance Plan (QAP) must be submitted to the DCM Inspector at the pre-construction conference.

☐	13. Pre-Roofing Conference: Required Attendees: Contractor, Owner, Architect, Roofing Sub, Roofing Manufacturer's Representative • Roofing submittals must be approved by the architect prior to pre-roofing conference • Roofing manufacturer must provide documentation that roof design and roofing materials meet code requirements for wind uplift and impact resistance • Copy of sample roof warranty – Note: Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees. Above Ceiling Inspections: Required Attendees: Contractor, Owner, Architect, MEP Engineers, Major Subs • All work must be completed except for installation of ceiling tiles, and/or hard ceilings • Space must be conditioned • Permanent power must be connected unless otherwise arranged with the DCM Inspector • Grease duct must be inspected and approved by the DCM Inspector prior to fire wrapping and above-ceiling inspection Life Safety Inspections and Final Inspection: Required Attendees: Contractor, Owner, Architect, Engineers, Major Subs, Local Fire Marshal • Fire alarm certification • Kitchen hood fire suppression system certification • General contractor's 5-year roofing guarantee (DCM Form C-9) • Roofing manufacturer's warranty • Above ground and below ground sprinkler certifications • Completed certificate of structural engineer's observations (for storm shelter) • Emergency and exit lighting tests • Fire alarm must be monitored • Elevator inspection completed and certificate of operation provided by the State of Alabama Department of Labor • Boiler/vessels inspection completed and certificate of operation provided by the State of Alabama Department of Labor • Pressure test/Flush test for underground sprinkler lines (witnessed by local fire marshal, fire chief and/or DCM Inspector) • Flush/pressure test for new and/or existing fire hydrants • Must have clear egress/access and emergency (for first responders) access to building • Must have ADA access completed Year-End Inspection: Required Attendees: Contractor, Owner, Architect, Engineers and/or Major Subs may be required • Owner's list of documented warranty items • Reconciliation of user fees with DCM shall be completed prior to inspection
☐	14. Other inspections required before work is covered
☐	15. Inspection report distribution – weekly per Owner-Architect Agreement
☐	16. Record Drawings, definition of, procedures, addenda posted, etc.
☐	*17. Project sign and other job signs
☐	18. Point of contact for project. Job Superintendent and phone number.
☐	*19. Overall phasing of job
☐	20. Contractor's duty to coordinate work of separate contractors
☐	*21. Use of site and existing building, access drive, signs
☐	*22. Use of existing toilets
☐	*23. Coordinate any utilities supplied by Owner
☐	*24. Coordinate outages and work in existing building with Owner
☐	25. Keeping existing exit paths open

☐	26. Routine job cleanup
☐	27. O.S.H.A. - Report all accidents - safety General Contractor's responsibility
☐	28. Contractor is reminded of obligation to comply with the Alabama Child Labor Law and E-verify
☐	29. Project limits
☐	30. Building location relative to critical property line, easement, setback, etc.
☐	31. Locating property line, corners, etc.
☐	32. Verify sanitary outfall before committing floor level
☐	33. ADEM land disturbance permits shall be required if site is over 1-acre.
☐	34. Procedure if bad soil or rock is encountered: Geotech and special inspections
☐	35. Stockpiling topsoil
☐	36. Protecting trees
☐	37. Soil compaction, type soil, lab tests, etc.
☐	38. Soil Treatment, mix on site in presence of Job Superintendent
☐	39. Surveyor to check foundation wall if location critical
☐	40. Ready mix plant, file delivery tickets, slump tests, cylinders
☐	41. Quality of concrete work; concrete testing
☐	42. Inspections before pouring concrete
☐	43. What is expected of masonry work, mortar additive
☐	44. Problems with hollow metal - install proper fire labels
☐	45. Pre-roofing Conference - no roofing materials installed prior to conference, all roofing submittals and warranties must have been reviewed and approved by the Architect prior to the Pre-roofing Conference. Manufacturer’s Representative must be present at Pre-roofing conference. The Roofing Manufacturer must show compliance with the IBC wind and impact-resistance requirements. Contractor shall video existing building interior and exterior prior to roofing operations and provide copy to Owner.
☐	46. General Contractor’s Roofing Guarantee and Manufacturer’s Roofing Warrantees must be presented to DCM Inspector at Final Inspection and submitted with Certificate of Substantial Completion
☐	47. Potential conflict of mechanical and electrical equipment; shop drawings
☐	48. Return air plenums (no combustibles)
☐	49. Fire damper installation issues
☐	50. Certificate of Substantial Completion/Final Inspection
☐	51. Conduct of contractor’s personnel. No interaction with staff and/or students. No foul language, no smoking or use of tobacco products, no drugs and no firearms on school property.
☐	52. Elevators/Pressure Vessels must be inspected and approved by the State of AL Dept. of Labor prior to final inspection.
☐	53. Life safety, fire alarm, sprinkler and kitchen hood fire suppression systems must be complete and certified prior to final Inspection. Also, exit and emergency lighting must be complete.
☐	54. Comply with ADA requirements: plumbing fixture heights, toilet partition widths, turnaround, signage, parking lot striping, etc.

☐	55. Coordinate with local fire authority to assure access to the building for firefighting equipment during construction and before final acceptance. Provide fire extinguishers as required.
☐	56. Light gauge metal roof framing and/or wood truss framing to be inspected by the structural engineer.
☐	57. Comply with fire hydrant requirement; coordinate with local Fire Authority or State Fire Marshal.
☐	58. Craft-faced insulation is not to be installed exposed.
☐	59. Fire alarm contractor and fire sprinkler contractor must be permitted through the State of Alabama Fire Marshal's Office. Provide permits.
☐	60. All sprinkler system valves must be electrically supervised
☐	*61. Fire alarm monitoring requirements
☐	62. Storm Shelter requirements a. Contractor's Statement of Responsibility and Quality Assurance Plan – Provide paperwork at Pre-Construction Conference b. Certification of Structural Observations from the Structural Engineer of Record must be attached to the Certificate of Substantial Completion form.
☐	63. Third-party inspections/special inspections
☐	64. Release of retainage – 30 days to complete punch list and closeout
☐	*65. Sales tax savings (Alabama Department of Revenue)
☐	66. Project Closeout - precedes Final Payment a. Warranties b. Operating and Maintenance Manuals c. As-built Drawings d. Other requirements
☐	67. Advertisement of Completion - start ad after substantial completion a. for projects less than $50,000.00, Owner advertises 1 week b. for projects $50,000.00 or more, Contractor advertises for 4 consecutive weeks
☐	68. Time Extensions
☐	69. Final Payment Application checklist

State of Alabama
Disclosure Statement

Required by Article 3B of Title 41, Code of Alabama 1975

ENTITY COMPLETING FORM

ADDRESS

CITY, STATE, ZIP TELEPHONE NUMBER

STATE AGENCY/DEPARTMENT THAT WILL RECEIVE GOODS, SERVICES, OR IS RESPONSIBLE FOR GRANT AWARD

ADDRESS

CITY, STATE, ZIP TELEPHONE NUMBER

This form is provided with:

☐ Contract ☐ Proposal ☐ Request for Proposal ☐ Invitation to Bid ☐ Grant Proposal

Have you or any of your partners, divisions, or any related business units previously performed work or provided goods to any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify below the State Agency/Department that received the goods or services, the type(s) of goods or services previously provided, and the amount received for the provision of such goods or services.

STATE AGENCY/DEPARTMENT	TYPE OF GOODS/SERVICES	AMOUNT RECEIVED

Have you or any of your partners, divisions, or any related business units previously applied and received any grants from any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify the State Agency/Department that awarded the grant, the date such grant was awarded, and the amount of the grant.

STATE AGENCY/DEPARTMENT	DATE GRANT AWARDED	AMOUNT OF GRANT

1. List below the name(s) and address(es) of all public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF PUBLIC OFFICIAL/EMPLOYEE	ADDRESS	STATE DEPARTMENT/AGENCY

2. List below the name(s) and address(es) of all family members of public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the public officials/public employees and State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF FAMILY MEMBER	ADDRESS	NAME OF PUBLIC OFFICIAL/ PUBLIC EMPLOYEE	STATE DEPARTMENT/ AGENCY WHERE EMPLOYED

If you identified individuals in items one and/or two above, describe in detail below the direct financial benefit to be gained by the public officials, public employees, and/or their family members as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

Describe in detail below any indirect financial benefits to be gained by any public official, public employee, and/or family members of the public official or public employee as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

List below the name(s) and address(es) of all paid consultants and/or lobbyists utilized to obtain the contract, proposal, request for proposal, invitation to bid, or grant proposal:

NAME OF PAID CONSULTANT/LOBBYIST	ADDRESS

By signing below, I certify under oath and penalty of perjury that all statements on or attached to this form are true and correct to the best of my knowledge. I further understand that a civil penalty of ten percent (10%) of the amount of the transaction, not to exceed $10,000.00, is applied for knowingly providing incorrect or misleading information.

Signature Date

Notary's Signature Date Date Notary Expires

Article 3B of Title 41, Code of Alabama 1975 requires the disclosure statement to be completed and filed with all proposals, bids, contracts, or grant proposals to the State of Alabama in excess of $5,000.

Revised: 09/2013

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Career Tech Center Machine Shop.

B. Owner's Name: Madison County Board of Education

C. Architect's Name: Nola | VanPeursem Architects, PC.

D. The Project consists of the construction of a Machine Shop for Career Tech Center, Madison County, Alabama.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Construction Contract - DCM Form C-5, dated August 2021 located in Section 00 50 00 - Construction Documents and Forms.

1.03 PRE-BID CONFERENCE

A. A pre-bid conference shall be held at the project site on August 9, 2022 at 3:30 P.M. CDT. Attendance is highly recommended for all General Contractors intending to submit a proposal and Major Subcontractors.

1.04 AID TO CONSTRUCTION

A. Obtain from Utility Company any additional charges for service of type, size and location called for. Include charges in bid to be paid by Contractor to appropriate party. Provide payment of these charges so as to allow logical progression of construction and avoid delay of completion.

1.05 WORK BY OWNER

A. Owner will supply the following for installation by Contractor:
   1. Napkin Disposals.
   2. Soap Dispensers.
   3. Toilet Tissue Dispensers.

1.06 OWNER OCCUPANCY

A. The Owner intends to occupy the Project by the date stated in the Agreement as the contract completion date.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.07 CONTRACTOR USE OF SITE AND PREMISES

A. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.

B. Provide access to and from site as required by law and by Owner:

C. Confine operations at site to area permitted by Owner.

D. Do not unreasonable encumber site with materials or equipment.

E. Assume full responsibility for protecting and safe-keeping of products stored on premises.

F. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

1.08 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

1.09 TIME

A. It is anticipated that the successful bidder will be issued a letter of intent within ten (10) days and notice to proceed within forty five (45) days of the bid date. Substantial completion must be achieved no later than August 1, 2023. Refer to Supplementary Conditions in Section 00 50 00 for contract requirements relating to substantial completion, liquidated damages and time extensions

1.10 PROJECT SUPERVISION

A. The Contractor shall employ a competent supervisor and necessary assistants who shall be in attendance at the project site at all times during performance of the work. The project supervisor shall not be moved to another project or otherwise fail to be in attendance at the project site until the project is substantially complete or until the Architect and Owner approve of the supervisor's absence from the project site.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00500 - Construction Documents and Forms: Agreement: Contract Sum , retainages , payment period , monetary values of unit prices.

B. Document 00500 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

C. Section 01 21 00 - Allowances: Payment procedures relating to allowances.

1.03 SCHEDULE OF VALUES

A. Submit a printed schedule on DCM Form C-10, July 2022, Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.

D. Include in each line item, the amount of Allowances specified in this section.

E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: 26th day through the 25th day of the next month.

B. Present required information in typewritten form.

C. Form: DCM Form C-10, July 2022, Application and Certification for Payment. Utilize Schedule of Values for listing items in Application and Certificate for Payment.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.

6. Authorized Change Orders.
7. Total Completed and Stored to Date of Application.
8. Percentage of Completion.
9. Balance to Finish.
10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

H. Submit six copies of each Application for Payment.

I. Include the following with the application:
1. Transmittal letter as specified for Submittals in Section 01 30 00.
2. Construction progress schedule, revised and current as specified in Section 01 30 00.
3. Affidavits attesting to off-site stored products.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.

B. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.

C. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract.

D. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change.

E. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.

F. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

G. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.

3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.

H. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

I. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

J. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

K. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

L. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Contingency allowance.

C. Payment and modification procedures relating to allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 20 00 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of Product to Contractor or Subcontractor, less applicable trade discounts, delivery to site applicable taxes and all profit and overhead.

B. Costs Not Included in Cash Allowances: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing.

C. Architect Responsibilities:
1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
2. Select products in consultation with Owner and transmit decision to Contractor.
3. Prepare Change Order.

D. Contractor Responsibilities:
1. Assist Architect in selection of products , and installers.
2. Obtain proposals from suppliers and installers and offer recommendations.
3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. A Closeout of contract funds remaining in Contingency Allowance will be fully credited to Owner by Change Order, plus a minimum of 5 percent for profit and overhead. At the Owner's discretion all or a portion of allowance may be reallocated for miscellaneous changes.

1.04 CONTINGENCY ALLOWANCE

A. Include the sum of $75,000.00 for Contingency Allowance. Contingency Allowance shall be used solely at the discretion of the Owner's project representative.

B. All profit and overhead is presumed to be included in the base bid & will not be added to charges covered by the Contingency Allowance.

C. All changes covered by Contingency Allowance will be approved by the Owner in writing.

D. Funds will be drawn from the Contingency Allowance by Change Order prior to Project Closeout.

E. At Closeout of contract funds remaining in Contingency Allowance will be fully credited to Owner by Change Order, plus a minimum of 5 percent for profit and overhead.

1.05 UNIT PRICE ALLOWANCE

A. All allowances are to be included in Contractor's base bid. The value of item 2.01 is determined by contractor based on unit prices.

B. General Contractor's profit and overhead are to be included in allowance. All other fees are presumed to be inclued in the base bid and will not be added to changes covered by the Allowances.

C. All changes covered by Allowances will be approved by the Owner, Construction Manager, and Architect in writing.

D. At closeout of contract, unused Allowances will be fully credited to Owner by Change Order. Unit prices shall be applied to unused quantities to determine dollar value.

E. Owner may reallocate allowance amounts to alternate scopes of work by applying unit prices to unused quantities to determine dollar values.

F. Items covered by allowance are part of the scope of work and do not relate to claims for delays or extensions of contract time.

1.06 ALLOWANCES SCHEDULE

A. Include a stipulated sum of $3,000.00 for exterior signage as indicated on drawings.

B. See Item 2.01 in Section 00 43 22 - Supplement B - List of Unit Prices / Allowances.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Site mobilization meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Coordination drawings.

F. Submittals for review, information, and project closeout.

G. Number of copies of submittals.

H. Submittal procedures.

1.02 PROJECT COORDINATION

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with buiklding utilites. 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 electgrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean uup of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

4. Major Subcontractors or Suppliers.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Designation of personnel representing the parties in Contract, major subcontractors, and the Architect.
5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
6. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

A. Topics covered under this section will be addressed at the above mentioned Preconstruction Meeting.

B. Architect will schedule a meeting at the Project site prior to Contractor occupancy.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special Consultants.
5. Contractor's Superintendent.
6. Major Subcontractors.

D. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements and occupancy prior to completion.
3. Temporary utilities provided by Owner.
4. Security and housekeeping procedures.
5. Schedules.
6. Application for payment procedures.
7. Procedures for testing.
8. Procedures for maintaining record documents.
9. Requirements for start-up of equipment.
10. Inspection and acceptance of equipment put into service during construction period.

E. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum two week intervals during initial phase of construction and at one week intervals upon commencement of application of finish materials.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.

3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that mechanical and electrical contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule every 30 days.

3.05 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
   1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus three that will be retained by Architect.
   2. Larger Sheets, Not Larger Than 30 x 42 inches: Submit the number of opaque reproductions that Contractor requires, plus three copies that will be retained by Architect.

B. Documents for Information: Submit two copies.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with approved form.

C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

F. Deliver submittals to Architect at 301 Jefferson Street, Huntsville, AL 35801.

G. Schedule submittals to expedite the Project, and coordinate submission of related items.

H. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

J. Provide space for Contractor and Architect review stamps.

K. When revised for resubmission, identify all changes made since previous submission.

L. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

M. Submittals not requested will not be recognized or processed.

N. Shop Drawings and/or submittals requiring resubmission to the Architect due to non-compliance with the Contract Documents and /or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Architect for review. The Contractor shall ensure the completeness and compliance of the submittal materials. Cost incurred by the Owner for review of submittals after the second submittal is rejected will be the responsibility of the Contractor at the rate of $150.00 per hour, including travel time.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 10 00 - Summary: Work sequence.

1.03 REFERENCES

A. AGC (CPSM) - Construction Planning and Scheduling Manual.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM.

1.04 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 30 days of Work with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.
   2. Notify Architect of any material or trade that may be a potential delay.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit under transmittal letter form specified in Section 01 30 00.

1.05 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: five years minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 24 x 36 inches or width required.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules for each stage of Work identified in Section 01 10 00.

E. Provide sub-schedules to define critical portions of the entire schedule.

F. Include conferences and meetings in schedule.

G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

H. Coordinate content with schedule of values specified in Section 01 20 00.

I. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Final Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner , and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals.

C. Mock-ups.

D. Control of installation.

E. Tolerances.

F. Testing and inspection Testing services.

G. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

C. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

D. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

E. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.04 REFERENCES AND STANDARDS - SEE SECTION 01 42 19

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Attend preconstruction meetings and progress meetings.
   8. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by the Architect. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.
   2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 45 33

CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.

B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
   3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.

C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.

1.03 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.

E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified

representative from the testing agency.

F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
      a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
   2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.05 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

C. The special inspector’s reports and testing agencies results shall have precedence over reports and test results provided by the contractor.

D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.06 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered

design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.

1. Special inspection reports and test results shall include, but not be limited to, the following:
    a. Date of inspection.
    b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
    c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.
        1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
    d. Name and signature of special inspector and / or testing agency representative performing the work.

B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.

C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.

D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITY

A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.

B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.

C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
    1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
    2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
    3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
    4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

D. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:

1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
   1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
   2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
   3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.

F. The contractor shall be responsible for costs of:
   1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
   2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
   3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.02 STRUCTURAL OBSERVATIONS

A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.03 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 SCHEDULES AND FORMS (ATTACHED)

4.01 STATEMENT OF SPECIAL INSPECTIONS.

4.02 SCHEDULE OF SPECIAL INSPECTIONS (SEE STRUCTURAL DRAWINGS).

4.03 FINAL REPORT OF SPECIAL INSPECTIONS.

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

Project:

Project Address:

Permit Applicant:

Applicant Address:

Owner:

Owner Address:

Registered Design Professionals (RDP):

Architect:

Geotechnical Engineer:

Structural Engineer:

Mechanical Engineer:

Electrical Engineer:

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than weekly.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Acknowledgement:

_____

Signature Date

Building Official's Acceptance:

_____

Signature Date

_____

Permit No.

Frequency of interim report submittals to building official:

☐ Monthly ☐ Bi-Monthly ☐ Upon Completion ☐ Per Attached Schedule

RDP in Responsible Charge

FINAL REPORT OF SPECIAL INSPECTIONS

Project:

Project Address:

Testing / Inspection Agent:

Testing / Inspection Agent Address:

Scope of Testing / Inspections:

(To be completed by Testing / Inspection Agent)

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.

Interim reports submitted prior to this final report and numbered _____ to _____, form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

(Attach 8 1/2" x 11" continuation sheet(s) if required to complete the description of corrections)

Special Inspector's Seal

Prepared By:

Type or print name

Signature Date

(Licensed Professional Engineer)

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary telephone service.

D. Temporary sanitary facilities.

E. Temporary Controls: Barriers, enclosures, and fencing.

F. Security requirements.

G. Vehicular access and parking.

H. Waste removal facilities and services.

I. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 51 00 - Temporary Utilities.

1.03 TELECOMMUNICATIONS SERVICES

A. Provide, maintain and pay for telephone service to field office at time of project mobilization.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities located at project site is not permitted.

C. New permanent facilities located at the site may not be used during construction operations.

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide protection for plants designated to remain. Replace damaged plants.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: Contractor's option.

1.07 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Criminal Background Checks: Effective July 21, 2002, an applicant for certification, licensure, or an applicant employed by a local school system or nonpublic school who will have unsupervised access to children in an educational environment and who has not completed a background check since July 1, 1999, as required by the Alabama Child Protection Act of 1999, shall be required to be fingerprinted for a criminal history background check through the Alabama Bureau of Investigation (ABI) and the Federal Bureau of Investigation pursuant to Act 2002-457. Please visit https://www.cogentid.com/index.htm for registration and fingerprinting.

C. Coordinate with Owner's security program.

1.08 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture. Contractor may designate area of existing structure as a field office.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls: Telephone service for administrative purposes.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Owner.

B. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.
   2. Exercise measures to conserve energy.

C. Provide temporary electric feeder from existing building electrical service at location as directed.

D. Complement existing power service capacity and characteristics as required.

E. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

F. Provide main service disconnect and over-current protection at convenient location and meter.

G. Permanent convenience receptacles may be utilized during construction.

H. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft .

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain 0.25 watt/sq ft H.I.D. lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY COOLING

A. Cost of Energy: By Contractor.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY VENTILATION

A. Utilize ventilation equipment as required to maintain clean air for construction operations.

1.08 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Connect to existing water source.
   1. Exercise measures to conserve water.
   2. Provide separate metering and reimburse Owner for cost of water used.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 56 36

TREE PROTECTION AND TRIMMING

PART 1 – GENERAL

1.01 SECTION INCLUDES

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 protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

1.3 DEFINITIONS

A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 SUBMITTALS

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

B. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

C. Qualification Data: For tree service firm and arborist.

D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.5 QUALITY ASSURANCE

A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.

B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.

C. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before tree protection and trimming operations begin, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities to review tree protection and trimming procedures and responsibilities.

PART 2 - PRODUCTS

2.1 **MATERIALS**

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.

B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.

1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.

C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

D. Fencing: Orange co-polymer barrier fence

E. Posts: 2” x 4” Wooden posts, 5’ ht.

F. Organic Mulch: Shredded hardwood, free of deleterious materials.

PART 3 - EXECUTION

3.1 **PREPARATION**

A. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete. This is a LEED requirement and must be adhered to.

1. Install orange co-polymer barrier fence fasteners to 5’ ht, 2” x 4” posts.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Mulch areas inside tree protection zones and other areas indicated.

1. Apply 3-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.

E. Maintain tree protection zones free of weeds and trash.

F. Do not allow fires within tree protection zones.

3.2 **EXCAVATION**

A. Install shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction.

2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.3 **REGRADING**

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.

B. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist, unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.

C. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

D. Moderate Fill: Where existing grade is more than 6 inches but less than 12 inches below elevation of finish grade, place drainage fill, filter fabric, and topsoil on existing grade as follows:

1. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of finish grade and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill up to 6 inches below elevation of grade.

2. Place filter fabric with edges overlapping 6 inches minimum.

3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.4 TREE PRUNING

A. Prune trees to remain that are affected by temporary and permanent construction.

B. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.

C. Pruning Standards: Prune trees according to ANSI A300 (Part 1)[.] [as follows:]

1. Type of Pruning: Reduction.

D. Cut branches with sharp pruning instruments; do not break or chop.

E. Chip removed tree branches and dispose of off-site.

3.5 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

B. Remove and replace trees indicated to remain that die or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size and species as those being replaced; plant and maintain as specified in Division 2 Section "Exterior Plants."

2. Provide new trees of 6-inch caliper size and of a species selected by Architect when damaged trees more than 6 inches in caliper size, measured 12 inches above grade, are required to be replaced. Plant and maintain new trees as specified in Division 2 Section "Exterior Plants."

C. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 12 inches deep at 24 inches on center. Backfill holes with an equal mix of augured soil and sand.

3.6 DISPOSAL OF WASTE MATERIALS

A. Burning is not permitted.

B. Disposal: Remove excess excavated material and displaced trees per Construction Waste Management Plan.

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 INCLUSION

ALL TEMPORARY EROSION AND SEDIMENT CONTROL FOR THIS PROJECT SHALL BE IN ACCORDANCE WITH THE FOLLOWING SECTION OF THE MADISON COUNTY STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC IMPROVEMENTS CONTRACT PROJECTS, LATEST EDITION

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 00 10 00 - Bid Documents and Forms: Instructions to Bidders: Product options and substitution procedures prior to bid date.

B. Section 01 40 00 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

D. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
   3. Have a published GreenScreen Chemical Hazard Analysis.

C. Provide interchangeable components of the same manufacture for components being replaced.

D. Motors: Refer to Section 22 05 13, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

F. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Architect will consider requests for substitutions only within 15 days after date of Agreement.

C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

E. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will reimburse Owner for all costs incurred for review or redesign services associated with approval by Architect or Architect's Consultants.

F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
1. Arrange and pay for product delivery to site.
2. On delivery, inspect products jointly with Contractor.
3. Submit claims for transportation damage and replace damaged, defective, or deficient items.
4. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
1. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
2. Handle, store, install and finish products.
3. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures.

B. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

C. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

E. Section 07 84 00 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that 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.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.
      d. Description of proposed work and products to be used.
      e. Alternatives to cutting and patching.
      f. Effect on work of Owner or separate Contractor.
      g. Written permission of affected separate Contractor.
      h. Date and time work will be executed.

1.04 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Noise Control: Provide methods, means, and facilities to minimize noise f produced by construction operations.

G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Utilize recognized engineering survey practices.

E. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

F. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

G. Periodically verify layouts by same means.

H. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-conforming work.

C. Execute cutting and patching including excavation and fill to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

K. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

L. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

M. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of final inspection.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at designated location.

C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93.

3.12 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect.

B. Accompany Architect on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Substantial Completion.

D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

E. Owner will occupy portions of the building as specified in Section 01 10 00.

F. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

G. Accompany Architect on preliminary final inspection.

H. Notify Architect when work is considered finally complete.

I. Complete items of work determined by Architect's final inspection.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Furnish service and maintenance of components indicated in specification sections during the warranty period.

D. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

E. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

F. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00500 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Include test and balancing reports.

O. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

A. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

B. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

C. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

D. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

G. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Photocopies of warranties and bonds.

H. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

I. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect , Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

l. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 40 00

DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

ALL SITE CLEARING WITHIN MADISON COUNTY RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH MADISON COUNTY SPECIFICATIONS. ALL OTHER SITE CLEARING SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of buildings and structures.

2. Demolition and removal of site improvements adjacent to a building or structure to be demolished.

3. Removing below-grade construction.

4. Disconnecting, capping or sealing, and removing site utilities.

5. Utility Company notifications.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

B. 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 recycled.

1.4 SUBMITTALS

A. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.

2. Coordination for shutoff, capping, and continuation of utility services.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

1.6 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of Work.

B. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required. Notify the Owner immediately of any required demolition, including utilities.

3.2 PREPARATION

A. Refrigerant: Remove and store refrigerant according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Arrange to shut off indicated utilities with utility companies.

2. If utility services are required to be removed, relocated, or abandoned, before proceeding with other demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.

C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

A. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

B. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.

1. Protect existing site improvements, appurtenances, and landscaping to remain.

2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

5. Protect adjacent exterior construction that are to remain and that are exposed to building demolition operations.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated existing buildings and structures and site improvements as indicated on the Drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials.

2. Maintain adequate ventilation when using cutting torches.

3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.5 MECHANICAL DEMOLITION

A. Remove buildings and structures and site improvements when permitted by authorities having jurisdiction.

B. Proceed with demolition of structural framing members systematically, from higher to lower level.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact or dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

3.6 EXPLOSIVE DEMOLITION

A. Explosives: Use of explosives is not permitted.

3.7 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 310000 "Earthwork."

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. General: Promptly repair damage to adjacent construction caused by building demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 05 12 00 - Structural Steel: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete.

B. ACI 318 - Building Code Requirements for Structural Concrete.

C. ACI 347R - Guide to Formwork for Concrete.

D. ASME A17.1 - Safety Code for Elevators and Escalators.

E. PS 1 - Structural Plywood.

1.04 DESIGN REQUIREMENTS

A. Construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 347, ACI 301, and ACI 318.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

2.03 FORMWORK ACCESSORIES

A. Form Release Agent: Colorless mineral oil that will not stain concrete, absorb moisture, impair natural bonding of concrete finish coatings, or affect color characteristics of concrete finish coatings.

B. Dovetail Anchor Slot: Galvanized steel, 22 gage thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Provide fillet strips on external corners of beams, joists, and columns.

G. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

H. Coordinate this section with other sections of work that require attachment of components to formwork.

I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water.

Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Position recessed anchor slots for brick veneer masonry anchors to spacing and intervals specified in Section 04 26 13.

E. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

F. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.07 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.08 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Concrete Construction.

B. ACI 318 - Building Code Requirements for Structural Concrete.

C. ACI SP-66 - ACI Detailing Manual.

D. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

E. CRSI (DA4) - Manual of Standard Practice.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Masonry Tie: ASTM A 82 steel wire, unfinished.

C. Steel Welded Wire Reinforcement: ASTM A 185/A 185M plain type.
   1. Flat Sheets.
   2. Mesh Size: 4x4.
   3. Mesh Size and Wire Gage: As indicated on drawings.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
1. Review locations of splices with Architect.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Conform to applicable code for concrete cover over reinforcement.

E. Bond and ground all reinforcement to requirements of Section 26 05 26.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 35 10 - Concrete Finishes.

D. Section 07 90 05 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

B. ACI 301 - Specifications for Concrete Construction.

C. ACI 302.1R - Guide to Concrete Floor and Slab Construction.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

E. ACI 305R - Guide to Hot Weather Concreting.

F. ACI 306R - Guide to Cold Weather Concreting.

G. ACI 308R - Guide to External Curing of Concrete.

H. ACI 318 - Building Code Requirements for Structural Concrete.

I. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

J. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

N. ASTM C150/C150M - Standard Specification for Portland Cement.

O. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

P. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

Q. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

R. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

S. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

T. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

U. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.

D. Test Reports: Submit report for each test or series of tests specified.

E. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

G. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 FIELD SAMPLES

A. All strength and control test required for concrete shall be performed by a laboratory selected and directed by the Architect, in accordance with provisions of Section 01 40 00.

B. The testing laboratory, under the direction of the Architect or his representative, shall make, identify, and transport to the testing laboratory a minimum of 1 set of 4 cylinders from each 50 cubic yards or from each day's pour if less than 50 cubic yards. Cylinders shall be made and cured in accordance with ASTM C31 and tested at 7 days and 2 cylinders at 28 days. The fourth cylinder shall be held in reserve and tested at 56 days in the event the 28-day strength is below specification requirements. The 7-day strength shall be at least 60 percent of the required 28-day compressive strength. Each strength test result shall be the average strength of 2 cylinders from the same sample tested at 28 days.

C. Make at least 1 slump test from each 25 cubic yards of concrete and from each sample from which cylinders are made. Slump tests shall be made in accordance with ASTM C143.

D. Percent of entrained air shall be determined in accordance with ASTM C231 on the sample from which cylinders are made.

1.06 COMPRESSION TESTS

A. Building Code Requirements for Reinforced Concrete: Evaluation of results of cylinder tests for concrete shall be according to Section 5 6 of ACI 318-95.

B. Qualification: Section 5 6 of ACI 318-95 is qualified as follows. No individual strength test result shall be less then the specified 28-day compressive strength for concrete placed in position of critical structural importance in the building or structure, the Architect's decision in identifying positions of critical structural importance in building or structure shall be final.

C. Compliance: Failure to comply with required evaluation procedure outlined in Paragraphs A and B above shall constitute questionable concrete and the following additional tests shall be made at no cost to the Owner:
   1. A minimum of 3 usable cores shall be taken from each area where questionable concrete was placed. Cores shall be taken and tested in accordance with ASTM C42 and Section 5 6 of ACI 318-95. Core test results shall be evaluated in accordance with Section 5 6, of ACI 318-95.
   2. If results of core tests do not meet acceptance criteria or if structural inadequacy is in doubt, the Architect may require remedial measures to be taken or load tests in accordance with Part 6, Chapter 20 of ACI 318-77.

1.07 DEFECTIVE CONCRETE

A. Where concrete fails to meet specified strength or where defects which cannot be repaired exist, the Work shall be removed and replaced, at Contractor's expense, with Work that meets specification requirements.

B. The Contractor is solely responsible for furnishing concrete of the strength, quality, and appearance specified.

1.08 BUILT-IN ITEMS

A. All items specified under other sections of the Project Manual which require being built into the concrete shall be installed as the concrete work progresses.

B. The Contractor shall be responsible for placing of items required by subcontractors.

C. Electrical conduits and other other pipes indicated to be embedded in concrete shall be of such size and location so as not to reduce strength of structures. Conduits less than 1 inch in diameter are not regarded as reducing strength of structure. Any areas weakened by conduit or pipe shall be reinforced with additional reinforcement as directed by the Architect.

1.09 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

E. Installer Qualifications: Concrete Installer must have placed at least 40,000 square feet of stained, exposed concrete slab on grade using concrete with a shrinkage reducing admixture within the past 3 years.

F. Manufacturer Qualifications: Concrete Manufacturer must have supplied at least 500 cubic yards of concrete using a shrinkage reducing admixture stained for stained exposed concrete slabs on grade within the past 3 years.

G. Finisher Qualifications: Concrete Finisher must have placed at least 40,000 square feet of stained, exposed concrete slab on grade using concrete with a shrinkage reducing admixture within the past 3 years.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C 260. Provide Air Mix manufactured by Euclid .

C. Chemical Admixtures: ASTM C 494/C 494M, Type F - Water Reducing, High Range and Type G - Water Reducing, High Range and Retarding.
   1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

D. Shrinkage Reducing Admixture: Eclipse Floor by Grace Concrete Products
   1. Shrinkage Reducing Admixture must be used at all stained, exposed concrete slabs on grade. Not required at polished concrete.
   2. Proportion dosage rate to provide a maximum shrinkage of 0.021% on a mix design that otherwise has a shrinkage of 0.030% based on ASTM C157 Shrinkage Tests. Shrinkage reduction must be based on trial mixtures. Provide results of ASTM C157 test results for trial mixtures as part of the mix design submittal.

2.05 ACCESSORY MATERIALS

A. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.

B. Epoxy Bonding System: ASTM C 881, type as required by project conditions.

C. Vapor Barriers (Underslab): Moistop Ultra® 15 Underslab Vapor Retarder (or approved equal), extremely durable and puncture resistant polyolefin manufactured from ISO certified virgin resins.
   1. Types:
      a. Premium Plus: Fortifiber® / Moistop Ultra® 15.
   2. Reference Standard:
      a. ASTM E 1745-97 Class B (premium).

b. ASTM E 1643
3. Puncture Resistance: 2000 grams minimum (premium), ASTM D-1709
4. Water Vapor Permeance: less than .02 perms (premium), ASTM F-1249
5. Products:
   a. Fortifiber Building Systems Group; Moistop Ultra 15 (Basis of Design): www.fortifiber.com.
   b. ISI Building Products: www.isibp.com
   c. Tex-Trude; Xtreme Vapor Barrier 15 mil.: www.tex-trude.com
   d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Chemical Hardener: Fluosilicate solution designed for densification of cured concrete slabs.

E. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours: 2,000 psi.

F. Moisture-Retaining Cover: ASTM C171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

G. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.06 BONDING AND JOINTING PRODUCTS

A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D1751, 1/2 inch thick and 4 inches deep; tongue and groove profile.

B. Construction Joint Devices: Integral extruded plastic; 1/2 inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

C. Sealant and Primer: As specified in Section 07 90 05.

2.07 CONCRETE MIX DESIGN

A. Mix and deliver concrete in accordance with ASTM C94.

B. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

C. Limit percentage of fly ash to 25% (by weight).

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer. Use of admixtures will not relax cold weather placement requirements.

E. Do not use admixtures that contain calcium chloride.

F. Use set retarding admixtures during hot weather only when approved by the Architect/Engineer.

G. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

H. Concrete at Slabs on Grade:
1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Minimum Cementitous Materials Content: 540 lb/cu. yd.
3. Maximum Water-Cementitious Materials Ratio: 0.45
4. Slump Limit: 4 inches, plus or minus 1 inch
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

I. Other Concrete:
1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.57
3. Slump Limit: 4 inches, plus or minus 1 inch

2.08 BATCHING

A. Provide necessary equipment to accurately determine and control the actual amount of materials entering the concrete mix. Weigh individual ingredients separately for each batch. The accuracy of weighing devices shall be such that successive quantities can be measured to within 1 percent of the desired amount.

B. Completely discharge contents of mixer before each new batch is loaded. The use of retempered concrete is not acceptable.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C 94 and as follows.
   1. Use a separate water metering device (not truck tank) for measuring water added to the original batch.
   2. The use of wash water as a portion of the mixing water is not acceptable. Dump all wash water added to empty drums after discharging, before a new batch is received.
   3. Mixing drums shall be watertight.
   4. Discharge concrete within 1-1/2 hours from time concrete was mixed, if central mixed, or from the time original water was added, if transit mixed.
   5. Producer shall furnish delivery tickets with each load of concrete delivered under this specification. Delivery ticket shall show clearly the class and strength of concrete, size of coarse aggregate, and the slump ordered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.04 SLAB JOINTING

A. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

B. Separate slabs on grade from vertical surfaces with joint filler.

C. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

D. Extend joint filler from bottom of slab to within 1/8 inch of finished slab surface. Conform to Section 07 90 05 for finish joint sealer requirements.

E. Install joint devices in accordance with manufacturer's instructions.

F. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Apply sealants in joint devices in accordance with Section 07 90 05.

H. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

I. Place concrete continuously between predetermined expansion, control, and construction joints.

J. Do not interrupt successive placement; do not permit cold joints to occur.

K. Place floor slabs in checkerboard or saw cut pattern indicated.

L. Saw cut joints within 8 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

M. Screed floors level, maintaining surface flatness of maximum 1/16 inch in 10 ft.

N. Concrete shall be placed by an ACI certified and experienced crew with sufficient equipment to place the entire panel or section in a continuous unbroken operation from beginning to end.

O. The conveying of concrete from the mixer to the forms shall be as rapid as possible. The conveying equipment shall be of sufficient capacity to ensure a practically continuous flow of concrete to the placing point without segregation or loss of materials.

P. No concrete that has partially hardened or been contaminated shall be deposited on the work, nor shall retempered concrete be used. In no case shall concrete be used when the elapsed time after addition of water to the batch exceeds 1-1/2 hours.

Q. All concrete shall be thoroughly spaded around reinforcement, embedded items, and faces of forms. Vibrators of an approved internal type shall be used to assist but not replace the spading. Concrete shall be placed and compacted in layers not over 18 inches thick.

R. Concrete shall not be allowed to drop freely more than 5 feet in unexposed work or more than 3 feet in exposed work. Where greater drops are required, a tremie or other approved means shall be employed to prevent segregation.

S. All concrete slabs shall be consolidated and screeded to an even surface by the use of a straight edge and screeding strips accurately and securely set to the proper grade and prepared for the specified finish. Depress slabs as required for toppings, setting beds, and tile. Slope surfaces 1/8 inch per foot to drains, unless otherwise shown.

T. On suspension of placing, all keys for joining work shall be made before initial set of concrete. All concrete deposited on exposed reinforcement for future work shall be washed off immediately.

3.05 CONCRETE FINISHING - SEE SECTION 03 35 10 - CONCRETE FINISHES.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.

C. Monitor rates of evaporation per ACI 305R. Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

E. Surface Not in Contact with Forms: Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
      b. Curing Compounds are not allowed at stained exposed concrete slabs.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 50 cu yd or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.09 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

END OF SECTION

SECTION 03 35 10

CONCRETE FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Scratch, broom, troweled, and non-slip finishes.

1.02 SAMPLE PANELS

A. Sample panels to be inspected by the Architect/Engineer for uniformity, color and texture.

B. The finishes in the complete structure shall match the sample panels approved by the Architect/Engineer.

C. Prepare sample panels of the following finishes:
   1. Rubbed Finish: Select a portion of the structure which will not be exposed to view and apply a rubbed finish. See Paragraph 3.01, Subparagraph D, Item 2 of this Section for rubbed finish requirements.

PART 2 PRODUCTS

2.01 LIQUID FLOOR HARDENERS

A. Fluosilicate Floor Hardener: Lapidolith by Sonneborn.

B. Substitions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 FORMED SURFACES FINISHES

A. Immediately after removal of forms, the surface shall be inspected by the Architect/Engineer.

B. Minor defects (1-1/2 inches or less in depth) in the Work shall be repaired by patching the same day the forms are removed. Defects shall be cut back at 90 degrees to the surface at least 1 inch deep without feather edges. After soaking with water, a dry mortar mix shall be packed into defect. In exposed work, the mortar mix shall be determined by trial method to produce a color and texture which will match adjoining concrete. After the mortar has attained its initial set, the patch shall be scraped or rubbed flush with the concrete and matched to the color and texture of the adjoining surface.

C. Description of Finishes:
   1. Common Finish: Remove all fins and loose material and patch defects and tie holes.
   2. Rubbed Finish: After applying a common finish, rub the surface as follows. Finish shall be produced on green concrete as soon as possible after removal of forms, but no later than the day following removal of forms. Surface shall be wet with water and rubbed with carborundum brick or other abrasive until a uniform color and texture are produced. No cement grout or slush shall be used other than the cement paste drawn from the green concrete by the rubbing process. Match finish of approved sample.

D. Schedule of Finishes:
   1. Common Finish: For all formed surfaces which will not be exposed to view in the finish structure.
   2. Rubbed Finish: For exposed surfaces where indicated on Drawings.

3.02 FLATWORK FINISHES

A. Slabs shall be consolidated and screeded to an even surface using a straight edge and screed strips to set accurately and securely to the proper grade and prepared for finishing. Surfaces shall slope to drains where applicable.

B. Exterior Concrete Walks, Platforms and Landings: Slope 1/8 inch per foot unless otherwise indicated. Walks shown crown in the center or if adjoining the building, slope away from the building unless otherwise shown. All exposed edges of walks shall be tooled to form 1/4 inch radius rounded edges.

C. Scratch Finish: Remove surface water and laitance and roughen the surface with a stiff brush, leaving the aggregate slightly exposed and rough to provide good mechanical bond.

D. Float Finish: Begin when water sheen has disappeared and the concrete has hardened sufficiently so that the weight of a man standing on it leaves only a slight imprint on the surface. Consolidate the surface by hand or machine floating. Recheck the trueness of surface at this state with a 10 foot straight edge applied at not less than 2 different angles. Cut down all high spots and fill all low spots to produce planes checking true under the straight edge in all directions with a tolerance not to exceed 1/8 inch every 10 feet. Immediately refloat the slab to a uniform, smooth granular texture.

E. Broom Finish: Provide a float finish and then score the surface in a transverse direction by drawing a broom or burlap belt across the surface, to a texture approved by the Architect/Engineer.

F. Trowel Finish: Provide a float finish and follow by steel troweling. Produce a smooth surface relatively free from defects with a power trowel. After the surface has hardened sufficiently, trowel by hand. After a ringing sound is produced as the trowel is moved over the surface, make the final troweling. Thoroughly consolidate the surface by hand troweling. The finish surface shall be free of trowel marks, pin holes, and other imperfections; producing a uniform texture and appearance, in a plane within the tolerance specified. Correct any deviation from the above condition which remains after troweling by grinding or filling with an approved material.

3.03 SCHEDULE OF FINISHES

A. Scratch Finish: For all concrete surfaces which will be covered with setting beds or topping.

B. Broom Finish: For all exterior walks, exterior steps, exterior landings, and entrance slabs.

C. Trowel Finish: For all interior floor slabs which are to be exposed or covered, and other areas where inidicated on Drawings.

D. Do not use curing compounds, hardeners, or sealers on areas to be covered with carpet.

3.04 FLOOR TREATMENTS

A. Exposed concrete floors: All exposed concrete floors shall be hardened with liquid floor hardener applied as follows:
   1. After slab is wet-cured and is a minimum of 10 to 12 days old, clean all dirt, oil, wax, paint, and other foreign matter from the surface and dry surface.
   2. Apply floor hardener at the rate of 100 square feet per gallon of undiluted liquid hardener. Hardener shall be applied in 3 diluted applications. Each application of undiluted hardener shall be flushed on the surface and distrubuted evenly with a long-handled soft bristle brush. Excess solution or puddles shall be mopped up. Between applications, allow floor to dry until no longer visibly wet before making next application.
   3. Applications shall be diluted solutions with the first application being 3 parts water to 1 part liquid hardener (by volume), second application 2 parts water to 1 part liquid hardener;

third application 1 part water to 1 part liquid hardener.

4. If visible excess crystals build up on the surface between applications, flush surface with water, rapidly brush with a stiff bristle broom, mop up excess water and allow sufrace to dry before next application.
5. If crystal build-up becomes a problem, the third application may be diluted more with the approval of the Architect/Engineer.
6. Surface shall be uniform in color and texture upon completion of the hardening process.
7. Contractor, along with supplier, shall furnish a 5 year guarantee certificate against dusting of concrete surface.

3.05 CURING

A. Curing of finished surfaces is specified in Section 03 30 00 - Cast-In-Place Concrete

3.06 INSPECTION

A. The Architect/Engineer or his representative shall inspect finished concrete for compliance with the requirement of this Section.

B. Areas which do not comply therewith shall be refinished or corrective measures made, directed by the Architect.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members, suspension cables, sag rods, and struts.

B. Base plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Alabama.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Wide Flange Shapes: ASTM A992/A992M, Grade 50.

C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

D. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

E. Pipe: ASTM A53/A53M, Grade B, Finish black.

F. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or ASTM A325M, Type 1, medium carbon, galvanized, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.

G. Headed Anchor Rods: ASTM F1554 Grade 36, plain.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Grout: Non-shrink, non-metallic aggregate type, complying with 1 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

J. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 20.

B. Shop prime structural steel members. Do not prime surfaces that will be field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. Provide shop testing of structural steel.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

C. Welded Connections: Visually inspect all shop-welded connections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel.

F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

G. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Plates: ASTM A283.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A307, plain.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

B. Lintels: As detailed; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of istallation means erector accepts existing conditions.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed .

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications and electrical room mounting boards.

B. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

B. PS 1 - Structural Plywood.

C. PS 20 - American Softwood Lumber Standard.

D. SPIB (GR) - Grading Rules.

1.03 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

E. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.04 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.05 CLEANING

A. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling as indicated, as indicated, and as indicated.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

B. Section 13 34 19 - Pre-Engineered Metal Buildings

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.06 SEQUENCING

A. Sequence work to ensure fireproofing, firestop, vapor retarder, and air barrier materials are in place before beginning work of this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulation:
   1. USG Thermafiber: www.thermafiber.com
   2. Certainteed
   3. Owens Corning
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C578 Type IV; Extruded polystyrene board with closed-cell foam and continuous skins on face and back surfaces; with the following characteristics:
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Board Size: 48 x 96 inch.
   4. Board Thickness: 1 inches.
   5. Board Edges: Square.
   6. Compressive Resistance: 25 psi.

2.03 BATT INSULATION MATERIALS

A. Type 1 Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Thermal Resistance: R of 25.
   2. Thickness: 8 inch.
   3. Facing: Unfaced.

B. Type 2 Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Thermal Resistance: R of 13.
   2. Thickness: 3-1/2 inch.
   3. Facing: Unfaced.

C. See Section 13 34 19 for batt insulation for Pre-Engineered Metal Building exterior walls and roof..

D. Manufacturers:
   1. USG Thermafiber.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Knauf Insulation GmbH: www.knaufinsulation.us.
   4. Owens Corning Corp: www.owenscorning.com.
   5. Rmax, Inc.; www.rmaxinc.com
   6. Thermal Ceramic S.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Tape: Polyester self-adhering type, mesh reinforced, 2 inch wide.

B. Insulation Fasteners: Impaling clip of plastic with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. 12 Gauge Wire.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

D. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

E. Retain insulation batts in place with wire mesh secured to framing members.

F. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIERS

PART 1 GENERAL

1.01 SUMMARY

A. Weather barrier membrane.

B. Seam Tape.

C. Flashing.

D. Fasteners.

1.02 REFERENCES

A. American Society for Testing and Materials
   1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
   2. ASTM C1193; Standard Guide for Use of Joint Sealants
   3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
   4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
   5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
   6. ASTM E96; Test Method for Water Vapor Transmission of Materials
   7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
   8. ASTM E2178; Test Method for Air Permeance of Building Materials
   9. 9. ASTM E2357; Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

B. Technical Association of the Pulp and Paper Industry
   1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

C. American Association of Textile Chemists and Colorists
   1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
   2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.03 SUBMITTALS

A. Refer to Section 01300 Submittal Procedures.

B. Product Data: Submit manufacturer current technical literature for each component.

C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.

D. Quality Assurance Submittals
   1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
   2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
   3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

E. Closeout Submittals
   1. Refer to Section 01780 Closeout Submittals.
   2. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.04 QUALITY ASSURANCE

A. Qualifications
   1. Installer shall have experience with installation of commercial weather barrier assemblies under similar conditions.
   2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.
   3. Source Limitations: Provide commercial weather barrier and accessory materials produced by single manufacturer.

B. Mock-up
   1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
      a. Mock-up size: 10 feet by 10 feet.
      b. Mock-up Substrate: Match wall assembly construction, including window opening.
      c. Mock-up may remain as part of the work.
   2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.

C. Pre-installation Meeting
   1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, Engineer, Installer, Owner's Representative, and Weather Barrier Manufacturer's Designated Representative.
   2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

1.05 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01600 Product Requirements.

B. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store weather barrier materials as recommended by weather barrier manufacturer.

1.06 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

B. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.

1.07 WARRANTY

A. Special Warranty
   1. Special weather-barrier manufacturer's warranty for weather barrier for a period of ten (10) years from date of purchase.
   2. Pre-installation meetings and jobsite observations by weather barrier manufacturer for warranty are required.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer:
   1. DuPont Weatherization Systems; www.construction.tyvek.com.
   2. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS

A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont™ Tyvek® CommercialWrap® and related assembly components.

B. Performance Characteristics:
   1. Air Penetration: 0.001 cfm/ft2 at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. Less than or equal to 0.04 cfm/ft2 at 75 Pa, when tested in accordance with ASTM E2357
   2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
   3. Water Penetration Resistance: 280 cm when tested in accordance with AATCC Test Method 127.
   4. Basis Weight: 2.7 oz/yd2, when tested in accordance with TAPPI Test Method T-410.
   5. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
   6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
   7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
   8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84. Flame Spread: 10, Smoke Developed: 10.

2.03 ACCESSORIES

A. Seam Tape: 3 inch wide, DuPont™ Tyvek® Tape for commercial applications.

B. Fasteners:
   1. DuPont™ Tyvek® Wrap Cap Screws, as distributed by DuPont: 1-5/8 inch rust resistant screw with 2-inch diameter plastic cap or manufacturer approved 1-1/4” or 2” metal gasketed washer

C. Sealants
   1. Provide sealants that comply with ASTM C920, elastomeric polymer sealant to maintain watertight conditions.
   2. Products:
      a. Sealants recommended by the weather barrier manufacturer.

D. Adhesives:
   1. Provide adhesive recommended by weather barrier manufacturer.

E. Primers:
   1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

F. Flashing
   1. DuPont™ FlexWrap™ NF, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.
   2. DuPont™ StraightFlash™, as distributed by DuPont: straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.
   3. DuPont™ StraightFlash™ VF, as distributed by DuPont: dual-sided straight flashing membrane materials for brick mold and non-flanged windows and doors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.02 INSTALLATION - WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

B. Install weather barrier prior to installation of windows and doors.

C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.

E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.

F. Window and Door Openings: Extend weather barrier completely over openings.

G. Overlap weather barrier
   1. Exterior corners: minimum 12 inches.
   2. Seams: minimum 6 inches.

H. Weather Barrier Attachment:
   1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

I. Apply 4 inch by 7 inch piece of DuPont™ StraightFlash™ or weather barrier manufacturer approved alternate to weather barrier membrane prior to the installation cladding anchors.

3.03 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.04 OPENING PREPARATION (FOR USE WITH NON-FLANGED WINDOWS - ALL CLADDING TYPES)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.05 FLASHING (FOR USE WITH NON-FLANGED WINDOWS - ALL CLADDING TYPES)

A. Cut 9-inch wide DuPont™ FlexWrap™ NF a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.

B. Cover horizontal sill by aligning DuPont™ FlexWrap™ NF edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.

C. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont™ FlexWrap™ NF.

D. Apply 9-inch wide strips of DuPont™ StraightFlash™ at jambs. Align flashing with interior edge of jamb framing. Start DuPont™ StraightFlash™ at head of opening and lap sill flashing down to the sill.

E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.

F. Install DuPont™ FlexWrap™ NF at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.

G. Coordinate flashing with window installation.

H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C 1193.

I. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

K. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.

3.06 FIELD QUALITY CONTROL

A. Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.

3.07 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. UL (FRD) - Fire Resistance Directory.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics.

1.04 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

PART 2 PRODUCTS

2.01 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: See Drawings for required systems and ratings.

2.02 MATERIALS

A. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:
   1. Manufacturers:
      a. 3M Fire Protection Products: www.3m.com/firestop.
      b. Hilti .
      c. Tremco: www.tremcofirestop.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers; conforming to the following:
   1. Manufacturers:
      a. A/DFire Protection Systems Inc: www.adfire.com.
      b. Tremco: www.tremcofirestop.com.
      c. USG: www.usg.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:
   1. Manufacturers:

a. A/DFire Protection Systems Inc: www.adfire.com.
b. Pecora Corporation: www.pecora.com.
c. Thermafiber, Inc: www.thermafiber.com.
d. Tremco: www.tremcofirestop.com
e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Firestop Devices - Wrap Type: Mechanical device with incombustible filler and sheet stainless steel jacket, intended to be installed after penetrating item has been installed; conforming to the following:
1. Manufacturers:
a. 3M Fire Protection Products: www.3m.com/firestop.
b. Tremco: www.tremcofirestop.com
c. Substitutions: See Section 01 60 00 - Product Requirements.

E. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:
1. Manufacturers:
a. 3M Fire Protection Products: www.3m.com/firestop.
b. Tremco: www.tremcofirestop.com
c. Substitutions: See Section 01 60 00 - Product Requirements.

F. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labelling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 90 05

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

1.02 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants.

C. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

D. SCAQMD 1168 - Adhesive and Sealant Applications.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

1.04 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 40 00.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.05 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.
   1. Provide a Twenty (20) year material warranty for exterior silicone sealants used in wall applications.
   2. The installation contractor shall issue a separate two (2) year warranty against defects in installed materials and workmanship, beginning from the date of Substantial Completion of the installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gunnable and Pourable Sealants:
   1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   2. Bostik Inc: www.bostik-us.com
   3. Dow Corning Corporation: www.dowcorning.com
   4. Tremco Global Sealants: www.tremcosealants.com
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Type 1 - General Purpose Exterior Sealant: Silicone; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
   1. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.

C. Type 2 - Exterior Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent;
   1. Color: Black.
   2. Size as required to provide weathertight seal when installed.
   3. Applications: Use for:
      a. Exterior wall expansion joints.

D. Type 3 - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.
      b. Concealed sealant bead in siding overlaps.

E. Type 4 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.

F. Type 5 - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
   1. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.

G. Type 6 - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
   1. Color: Gray.
   2. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056 sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

3.06 SCHEDULE

A. Control and Expansion Joints in Paving: Type 6.

B. Exterior Wall Expansion Joints: Type 2.

C. Lap Joints in Exterior Sheet Metal Work: Type 3.

D. Butt Joints in Exterior Metal Work and Siding: Type 1.

E. Joints Between Exterior Metal Frames and Adjacent Work (except masonry): Type 1.

F. Under Exterior Door Thresholds: Type 3.

G. Interior Joints for Which No Other Sealant is Indicated: Type 4; colors as shown on the drawings.

H. Control and Expansion Joints in Interior Concrete Slabs and Floors: Type 6.

I. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type 5.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Fire-rated steel doors and frames.

C. Thermally insulated steel doors.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 90 00 - Paints and Coatings: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

B. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

C. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames.

D. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.

E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

F. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Assa Abloy Ceco or Curries: www.assaabloydss.com
   2. Mesker: www.meskerdoor.com.
   3. Overly Manufacturing Company: www.overly.com.
   4. Republic Doors: www.republicdoor.com.
   5. Steelcraft, an Ingersoll Rand brand: www.steelcraft.com

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Texture: Smooth faces.
   3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   4. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   5. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

A. Exterior Doors :
   1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
   2. Core: Polyurethane.
   3. Top Closures : Flush with top of faces and edges.

B. Interior Doors , Non-Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
   2. Core: Polyurethane.

C. Interior Doors , Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
   2. Fire Rating: As indicated on drawings, tested in accordance with UL 10C ("positive pressure").
      a. Provide units listed and labeled by UL.
   3. Core: Mineral fiberboard.

2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door.
   2. Finish: Same as for door.

B. Exterior Door Frames: Face welded, seamless with joints filled.
   1. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames , Non-Fire-Rated: Face welded type.

D. Interior Door Frames , Fire-Rated: Face welded type.

2.05 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08 80 00 , factory installed.

B. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10 , door manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Coordinate installation of hardware.

E. Coordinate installation of glazing.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 33 23

ROLLING OVERHEAD DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions, and Division 1 General Requirements, apply to the work of this Section.

1.02 SUMMARY

A. The work of this Section includes rolling overhead and counter doors.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers product data and installation instructions for each type of rolling counter door. Include both published data and any specific data prepared for this project.

B. Shop Drawings: Submit shop drawing for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

1.04 QUALITY ASSURANCE

A. Manufacturer: Rolling doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of rolling counter doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.

B. Installer: Installation of rolling doors shall be performed by the authorized representative of the manufacturer.

C. Single-Source Responsibility: Provide doors, guides, motors, and related primary components from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturers instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Overhead Door Corporation: www.overheaddoor.com

B. Cornell Iron Works, Inc.: www.cornelliron.com

C. Substitutions: See Section 01 60 00 – Product Requirements.

2.02 OVERHEAD INSULATED DOORS

A. Trade Reference: 625 Series Stormtite Insulated Service Doors by Overhead Door Corporation.

B. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
   1. Flat profile type F-265I for doors up to 40´0" wide. The front slat shall be fabricated of 20 gauge galvanized steel. The back slat shall be 24 gauge galvanized steel.
   2. Slat cavity shall be filled with CFC-free foamed-in- place, polyurethane insulation.

C. Finish:
   1. Galvanized Steel: Slats and hood shall be galvanized steel in accordance with ASTM A 525 and receive rust-inhibitive, roll coating process, including bonderizing, 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester (powder coated) top coat. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

D. Color: Powder coating finish in color as selected by Architect from manufacturers standard colors.

E. Windload Design: 20 PSF.

F. Weatherseals: Vinyl bottom seal, exterior guide and internal hood seals. Lintel seals.

G. Bottom Bar: Two prime painted steel angles, thickness 1/8" bolted back to back to reinforce curtain in the guides.

H. Guides: Three (galvanized) structural steel angles with minimum thickness of 3/16". Guides shall be weatherstripped with a vinyl weather seal at each jamb, on the exterior curtain side.

I. Brackets: Hot rolled steel to support counterbalance, curtain and hood.

J. Counterbalance: Helical torsion spring type designed for standard 20,000 cycle life design. Counterbalance shall be housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.

K. Hood: Galvanized steel, 24 gauge hood with intermediate supports as required. Provide with internal hood baffle weatherseal.

L. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
   1. Sensing Edge Protection: Pneumatic sensing edge.
   2. Operator Controls: Push-button and key operated control stations with open, close, and stop buttons for flush mounting, for interior location.

M. Locking: Interior slide bolt lock for electric operation with interlock switch.

N. Wall Mounting Condition: Between jambs mounting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimension and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Strictly comply with manufacturers installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

B. Instruct Owners personnel in proper operating procedures and maintenance schedule.

3.03 ADJUSTING AND CLEANING

A. Test rolling doors for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Touch-up damaged coatings and finishes and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

END OF SECTION

SECTION 087100

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 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
   1. ANSI/BHMA Certified Product Standards - A156 Series.
   2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
   3. ANSI/UL 294 - Access Control System Units.
   4. UL 305 - Panic Hardware.

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. 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.

F. 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.

1.4 QUALITY ASSURANCE

A. 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.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. 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.

D. 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. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. 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.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. 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.

H. 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

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 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".

1.6 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 Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. 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.

1.7 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. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual overhead door closer bodies.
4. Five years for motorized electric latch retraction exit devices.
5. Two years for electromechanical door hardware, unless noted otherwise.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified 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, oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
      b. Interior Doors: Standard weight, steel, 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 the all out-swinging lockable doors.
   5. Manufacturers:
      a. Hager Companies (HA).
      b. McKinney (MK).
      c. Stanley Hardware (ST).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified 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. Pemko (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. 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. McKinney (MK) - QC (12 wires) Option.

B. 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 (12 wires) Option.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
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. Door Controls International (DC).
   b. Rockwood (RO).
   c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
1. Manufacturers:
   a. Sargent Manufacturing (SA).

C. 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.Match Facility Standard.

D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

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. Existing System: Field verify and key cylinders to match Owner's existing system.

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.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.
2. Manufacturers:
a. Sargent Manufacturing (SA) - 8200 Series.

2.7 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.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. 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.

2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
8. Extended cycle test: Devices to have been cycle tested 50 million cycles.
9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
   1. Manufacturers:
      a. Sargent Manufacturing (SA) - 80 Series.

2.9 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
   1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
   2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
   3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
   4. Manufacturers:
      a. Sargent Manufacturing (SA) - 80 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
   1. Manufacturers:
      a. Norton Rixson (NO) - 7500 Series.
      b. Sargent Manufacturing (SA) - 351 Series.
      c. Yale Commercial(YA) - 4400 Series.

2.11 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 certified 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. Hiawatha, Inc. (HI).
      b. Rockwood (RO).
      c. Trimco (TC).

2.12 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 certified 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. Hiawatha, Inc. (HI).
      b. Rockwood (RO).
      c. Trimco (TC).

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. Sargent Manufacturing (SA).

2.13 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 NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:
   1. National Guard Products (NG).
   2. Pemko (PE).
   3. Reese Enterprises, Inc. (RE).

2.14 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. Sargent Manufacturing (SA) - 3280 Series.
b. Security Door Controls (SD) - DPS Series.
c. Securitron (SU) - DPS Series.

B. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.
1. Manufacturers:
a. Securitron (SU) - AQD Series.
b. Altronix (AS) - Maximal 3.

2.15 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.

2.16 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. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. 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 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.

3.5 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.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 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. SA - SARGENT
5. RF - Rixson
6. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 100.1
Description: Exterior Card Access / Exit

1	Continuous Hinge	CFM83SLF-HD1 SER12		PE	
1	Rim Exit Device, NL, ELR, RX	55 56 64 8804 PSB	US32D	SA	
1	Permanent Core	6300	US15	SA	
1	Door Closer	351 CPS	EN	SA	
1	Kick Plate	K1050 10" x 2" L.D.W.	US32D	RO	
1	Threshold	1715AK x Opening Width		PE	
1	Gasketing	303AV x Head & Jambs		PE	
1	Rain Guard	346C x L A R		PE	
1	Sweep	315CN x Door Width		PE	
1	DPS Switch	3287		SA	
1	Card Reader	By Others		00	
1	Power Supply	AQD Series as Required		SU	

Notes: Door position is monitored by magnetic switch for authorized egress.
Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device.
OPERATION: Card reader outside temporarily retracts latchbolt - auto relock. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.

Set: 2.0

Doors: 100.3, 100.4
Description: Exterior Nightlatch Function Exit

1	Continuous Hinge	CFM83SLF-HD1		PE
1	Rim Exit Device, Nightlatch	64 8804 PSB	US32D	SA
1	Permanent Core	6300	US15	SA
1	Door Closer	351 CPS	EN	SA
1	Kick Plate	K1050 10" x 2" L.D.W.	US32D	RO
1	Threshold	1715AK x Opening Width		PE
1	Gasketing	303AV x Head & Jambs		PE
1	Rain Guard	346C x L A R		PE
1	Sweep	315CN x Door Width		PE
1	DPS Switch	3287		SA
1	Card Reader	By Others		00
1	Power Supply	AQD Series as Required		SU

Notes: Door contact switch indicates propped door condition.

Set: 3.0

Doors: 101, 102
Description: Entry Function + Occupancy Indicator + Closer

3	Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Office/Entry Lock, Indicator	V20 64 8256 LNB	US26D	SA
1	Permanent Core	6300	US15	SA
1	Surface Closer	TB 351 O	EN	SA
1	Kick Plate	K1050 10" x 2" L.D.W.	US32D	RO
1	Mop Plate	K1050 4" x 1" L.D.W.	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL x Head & Jambs		PE
1	Coat Hook	802	US26D	RO

Set: 4.0

Doors: 103A
Description: Storeroom Function + O H Stop / Holder

3	Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 8204 LNB	US26D	SA
1	Permanent Core	6300	US15	SA
1	Surf Overhead Hold Open	9-X26	630	RF
3	Silencer	608		RO

Set: 5.0

Doors: 104
Description: Storeroom Function + Closer / Stop

3	Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	64 76 8204 LNB	US26D	SA
1	Permanent Core	6300	US15	SA
1	Door Closer	351 CPS	EN	SA
1	Gasketing	S88BL x Head & Jambs		PE

Set: 6.0

Doors: 103.1
Description: Storeroom Function Pair + O H Stops / Holders

6	Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	64 8204 LNB	US26D	SA
1	Permanent Core	6300	US15	SA
2	Surf Overhead Hold Open	9-X26	630	RF
2	Silencer	608		RO

Notes: Overlapping astragal by door manufacturer.

Set: 7.0

Doors: 100.2
Description: Overhead Coiling Door

2	Permanent Core	6300	US15	SA
2	Mortise Cylinder	64 41	US15	SA

Notes: Coordinate cylinder requirements with door supplier.
Balance of hardware by door manufacturer.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2004.

C. ASTM C1036 - Standard Specification for Flat Glass.

D. ASTM E773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 2001.

E. ASTM E774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.

F. GANA (GM) - GANA Glazing Manual.

G. GANA (SM) - GANA Sealant Manual.

H. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples 12x 12 inch in size of glass units, showing coloration.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 GLASS MATERIALS

A. Float Glass Manufacturers:
   1. AGC Glass Company North America, Inc: www.us.agc.com
   2. Guardian Industries Corp: www.sunguardglass.com
   3. Pilkington North America, Inc.: www.pilkington.com/na.
   4. Vitro Architectural Glass: www.vitroglazings.com
   5. Substitutions: Refer to Section 01 60 00 - Product Requirements.

B. Float Glass: All glazing is to be float glass unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
   3. Thicknesses: 1/4 inch thick; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

C. Glass-Ceramic Safety Glazing: UL- or WH-listed as fire-protection-rated glazing and complying with 16 CFR 1201 test requirements for Category II without the use of a surface-applied film.
   1. Thickness: 1/4 inch thick.

2.02 GLAZING COMPOUNDS

A. Butyl Sealant: Single component; Shore A hardness of 10 to 20; black color; non-skinning.

B. Acrylic Sealant: Single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; color as selected.

C. Silicone Sealant [<>]: Single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; cured Shore A hardness of 15 to 25; color as selected.

2.03 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; color to be selected.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

3.03 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.04 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

B. Locate and secure glazing pane using spring wire clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Gypsum sheathing.

C. Gypsum wallboard.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 2100 - Thermal Insulation: Acoustic insulation.

C. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

D. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

D. GA-216 - Application and Finishing of Gypsum Panel Products.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

A. Perform in accordance with GA-214 and GA-216. Comply with requirements of GA-600 for fire-rated assemblies.

B. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Exception: The minimum metal thickness and section properties required of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
   2. Studs: "C" shaped with flat or formed webs.
   3. Runners: U shaped, sized to match studs.
   4. Ceiling Channels: I studs.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com
   2. CertainTeed Corporation: www.certainteed.com
   3. Continental Building Products: www.continental-bp.com
   4. Georgia-Pacific Gypsum: www.gpgypsum.com
   5. National Gypsum Company: www.nationalgypsum.com
   6. Temple-Inland Building Product by Georgia-Pacific, LLC: www.temple.com.
   7. USG Corporation: www.usg.com

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.

C. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Thickness: As indicated on drawings.
   3. Edges: Square.
   4. Glass Mat Faced Products:
      a. CertainTeed Corporation; GlasRoc Brand.
      b. Georgia-Pacific Gypsum; DensGlass Sheathing.
      c. Temple-Inland Building Products by Georgia-Pacific, LLC; GreenGlass Exterior Sheathing.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Water-Resistive Barrier: As specified in Section 07 25 00.

B. Corner Beads: Galvanized steel.

C. Trim: GA-201 and GA-216; Bead type as detailed.

D. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Studs: Space studs as indicated.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
3. Extend stud framing through ceiling to deck above, only where indicated. Provide extended leg ceiling runners.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install wood blocking for support of:
1. Wall mounted cabinets.
2. Plumbing fixtures.
3. Toilet partitions.
4. Toilet accessories.
5. Wall mounted door hardware.

3.03 BOARD INSTALLATION

A. Comply with ASTM C 840, ASTM C 840, and ASTM C 840. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

F. Installation on Metal Framing: Use screws for attachment of all gypsum board.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

E. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two full size samples illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 24 inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.07 PROJECT CONDITIONS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is

completed, tested, and approved. This includes above ceiling inspection and subsequent corrective work required by authorities having jurisdiction over this project.

B. Install acoustical units after interior wet work is dry.

1.08 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Provide 1 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers:
1. Armstrong World Industries, Inc: www.armstrong.com.
2. CertainTeed Corporation: www.certainteed.com.
3. USG: www.usg.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Acoustical Panels: Vinyl faced gypsum, with the following characteristics:
1. Size: 24 x 24 inches.
2. Thickness: 1/2 or 5/8 inches.
3. Edge: Square.
4. Surface Color: White.
5. Surface Pattern: Lightly textured.
6. Sag Resistant.
7. Ten Year Limited Warranty for the date of substantial completion against visible sag, warping, shrinking, buckling, and delamination as a direct result of manufacturing defects.
8. Suspension System: Exposed aluminum grid.

2.02 SUSPENSION SYSTEM(S)

A. Manufacturers:
1. Same as for acoustical units.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

C. Exposed Aluminum Suspension System: Extruded aluminum; intermediate-duty.
1. Profile: Tee; 15/16 inch wide face.
2. Construction: Double web.
3. Finish: Painted white.
4. Space hangers at 3 feet on center to achieve intermediate-duty classification.

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Acoustical Insulation: Specified in Section 07 21 00.
1. Size: To fit acoustical suspension system.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:240.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Miter corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

H. Where round obstructions and bullnose concrete block corners occur, provide preformed closures to match perimeter molding.

I. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

J. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

B. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.05 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Provide 25 lineal feet of base, of each type and color specified.

PART 2 PRODUCTS

2.01 RESILIENT BASE

A. Base: Type TS rubber, vulcanized thermoset; top set Style B, Cove:
   1. Height: 4 inch.
   2. Thickness: 0.080 inch thick.
   3. Finish: Satin.
   4. Length: 4 foot sections.
   5. Accessories: Premolded external corners and end stops.
   6. Manufacturers:
      a. Johnsonite, Inc.; Product Rubber Wall Base.
      b. Roppe Corp.; Product Pinnacle Rubber Base.
      c. Flexco; Product Wallflowers Rubber Wall Base: www.marleyflexco.com

2.02 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Rubber.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is cured.

C. Clean substrate.

D. Flooring shall not commence until such time that the roof is complete, all site concrete and asphalt is installed, and above ceiling work is completed and verified.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Flooring exhibiting evidence of staining and/or damage from construction traffic shall be replaced at Contractor's expense.

END OF SECTION

SECTION 09 77 33

FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. FDA Food Code - Chapter 6 - Physical Facilities.

D. ISO 846 - Plastics - Evaluation of the Action of Microorganisms.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 3 by 3 inch in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.05 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fiber Reinforced Plastic Panels:
   1. Marlite; : www.marlite.com
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels :
   1. Panel Size: 4 by 8 feet (1219 mm by 2438 mm).
   2. Panel Thickness: 0.090 inch (2.3 mm).
   3. Color: To be selected from manufacter's standard selection by Architect.
   4. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

A. Panels: Glass fiber reinforced plastic, complying with ASTM D5319.
   1. Surface Burning Characteristics: Flame Spread Index of 25, maximum; Smoke Developed Index of 450, maximum; when whole system is tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Scratch Resistance: Barcol hardness score of not less than 35, when tested in accordance with ASTM D2583.
   4. Impact Strength: Not less than 7 ft-lbs/in, when tested in accordance with ASTM D256.
   5. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.
   6. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Silicone; clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades or drill bits, or cut with snips.

C. Apply adhesive to the back side of the panel using trowel recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, if required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails as required.

I. Seal gaps at floor, ceiling, and between panels with specified sealant to prevent moisture intrusion.

J. Remove excess sealant as paneling is installed.

END OF SECTION

SECTION 09 90 00

PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Interior walls and bottom of swimming pools.
   3. Mechanical and Electrical:
      a. Referf to Mechanical and Electrical specifications for schedule of color coding of equipment, ductwork, piping, and conduit.
      b. In finished areas, paint all insulated and exposed pipes, unless otherwise indicated.
      c. In finished areas, paint shop-primed items.
      d. Paint all exposed mechanical, plumbing, or electrical accessories on sloped roof areas, including that which is factory-finished.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically so indicated.
   6. Ceramic and other tiles.
   7. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   8. Exterior insulation and finish system (EIFS).
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all finishing products, including VOC content.

C. Samples: Submit two paper chip samples, 8-1/2 x 11 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience.

1.06 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide door and frame assembly illustrating paint coating color, texture, and finish.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

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 candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.
2. Benjamin Moore & Co: www.benjaminmoore.com
3. PPG Architectural Finishes, Inc: www.ppgaf.com
4. Sherwin-Williams Company: www.sherwin-williams.com

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
   1. Primers maybe tinted to 50 percent of finish color.

C. Volatile Organic Compound (VOC) Content:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Chemical Content: The following compounds are prohibited:
   1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of latex enamel.

2.04 PAINT SYSTEMS - INTERIOR

A. Paint CI-TR-2SA - Concrete, Transparent, Sillicone Acrylic, Sealer, 2 Coat:
   1. Gloss: Two coats of Sherwin Williams H&C Clear 23 Sealer or approved equal.

B. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
   1. One coat of latex primer.
   2. Semi-gloss: Two coats of latex enamel.

C. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
   1. Touch-up with latex primer.
   2. Semi-gloss: Two coats of latex enamel.

D. Paint MI-OP-DF - Ferrous Metals, Primed/Unprimed, Waterborne Acrylic, 3 Coat:
   1. One coat of Pro Industrial Pro-Cryl Primer by Sherwin Williams or equal.
   2. Semi-Gloss: Two coats of Pro Industrial Waterborne Acrylic Dryfall by Sherwin Williams or equal.

E. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
   1. One coat of alkyd primer sealer.
   2. Semi-gloss: Two coats of latex enamel.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   4. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing coatings that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

I. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

J. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's instructions.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

H. Label all fire and smoke walls in accordance with applicable Building Codes.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 SCHEDULE - PAINT SYSTEMS

A. Concrete, Concrete Block: Finish all surfaces exposed to view.
   1. Interior: Floor as indicated, CI-TR-2SA.

B. Gypsum Board: Finish all surfaces exposed to view.
   1. Interior Ceilings and Bulkheads: GI-OP-3L, semi-gloss.

C. Steel Doors and Frames: Finish all surfaces exposed to view; MI-OP-2L, gloss.

D. Steel Fabrications: Finish all surfaces exposed to view.
   1. Exterior: ME-OP-2L, gloss.
   2. Interior: MI-OP-3L, gloss.
   3. Interior exposed structure: MI-OP-DF, semi-gloss.

END OF SECTION

SECTION 10 14 41

PLASTIC SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Raised letter plastic signs.

1.02 REFERENCES

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.

C. Samples: Submit two sample signs, 8 x 8 inch in size illustrating type, style, letter font, and colors specified; method of attachment.

D. Manufacturer's Installation Instructions: Include installation template and attachment devices.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code and ANSI/CABO A117.1 for requirements for the physically handicapped.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Package signs, labeled in name groups.

B. Store adhesive attachment tape at ambient room temperatures.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Signs:
   1. Bayuk Graphic Systems, Inc.: 5005 W. Old Lincoln Highway, Parkesburg, PA 19365. Phone 717-442-0274.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RAISED LETTER SIGNS

A. Base Material: To be selected from solid color acrylic plastic, laminated with 1/8" matte clear acrylic, reverse painted:
   1. Total Thickness: 1/4 inch.
   2. Size: As indicated on Drawings.
   3. Edges: Radiused

B. Raised Character Size and Style: Acrylic plastic, character adhered to base material:
   1. Comply with applicable provisions of ANSI/ICC A117.1, including Braille.
   2. Character Color: To be selected.
   3. Character Thickness: 1/8 inch.
   4. Height: As shown on plans.
   5. Edges: Radiused.
   6. Character Font: Helvetica.
   7. Character Case: Upper case only.

2.03 ACCESSORIES

A. Mounting Hardware: Chrome screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after surfaces are finished, in locations indicated.

C. Position signs as indicated on drawings.

END OF SECTION

SECTION 10 28 00

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessories for toilet rooms.

B. Grab bars.

C. Electric Hand Dryers.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.04 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Toilet Accessories:
   1. American Specialties, Inc: www.americanspecialties.com
   2. Bobrick Washroom Equipment, Inc.: www.bobrick.com
   3. Bradley Corporation: www.bradleycorp.com
   4. Substitutions: Section 01 60 00 - Product Requirements.

B. All items of each type to be made by the same manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide two keys for each accessory to Owner ; master key all lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.

E. Adhesive: Two component epoxy type, waterproof.

F. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof , security type.

2.03 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

2.04 TOILET ROOM ACCESSORIES

A. Toilet Paper Dispenser: Furnished by Owner, installed by General Contractor at each toilet.

B. Soap Dispenser: Furnished by Owner, installed by General Contractor at locations designated on drawings.

C. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
   1. Size: 24 inches x 36 inches.
   2. Frame: 0.05 inch angle shapes, with mitered corners, and tamperproof hanging system; No.4 finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

D. Grab Bars: Stainless steel, 1-1/2 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
   1. Length and configuration: As indicated on drawings.
   2. Product: 800 Series manufactured by Bradley Corp or approved equal.

E. Sanitary Napkin Disposal Unit: Furnished by Owner, installed by General Contractor at locations designated on drawings.

F. Electric Hand Dryers: Refer to electrical specifications and drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Accessories.

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers.

B. UL (DIR) - Online Certifications Directory.

1.03 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers, Cabinets and Accessories:
   1. JL Industries, Inc: www.jlindustries.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.
   4. Substitutions: See Section 01600 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Dry Chemical Type Fire Extinguishers: Cast steel tank, with pressure gage.
   1. Class 4A-80B:C.
   2. Size 10.
   3. Finish: Baked enamel, red in color.
   4. All Fire Extinguishers must be certified on or after the date of substantial completion.

2.03 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers on wall brackets.

END OF SECTION

SECTION 10 73 13

PROTECTIVE COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Canopy System.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.

B. Section 04810 - Unit Masonry Assemblies.

1.03 REFERENCES

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2000.

B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.

1.04 SYSTEM DESCRIPTION

A. Systems specified in this section are to be designed under direct supervision of a professional structural engineer experienced in the design of this work and licensed in the State of Alabama.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for specified systems, including all components.

C. Shop Drawings: Indicate layout heights, component connection details, and details of interface with adjacent construction.

D. Selection Samples: Two sets of color chips representing manufacturer's full range of available colors.

E. Manufacturer's printed installation instructions for specified systems, including each component.

F. Warranty documents, issued and executed by manufacturer, countersigned by Contractor.

1.06 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Furnish systems manufacturer's standard warranty against defects in product workmanship and materials, including deterioration of metal finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Peachtree Protective Covers, Kennesaw, GA.,

B. E. L. Burns Company, Shreveport, LA.

C. Evans Awning Company, Decatur, AL

D. Dittmer Architectural Aluminum, Winter Springs, FL.

E. Tennessee Valley Metals, Inc.

F. Substitutions: See Section 01600 - Product Requirements.

G. Unless otherwise specified for an individual product or material, supply all products specified in this section from the same manufacturer.

2.02 CANOPY SYSTEM

A. Roof Panels at Sloped Roof Areas: Supplied and installed by Roofing Contractor.

B. Roof Panels at Flat Roofed Areas.
   1. Deck Sections: 3 inch high, 0.084 inch minimum thickness.

C. Fascia: Extruded box fascia:
   1. Material: Extruded aluminum conforming to ASTM B 221 (ASTM B 221M), alloy 6063-T6.
   2. Extrusion wall thickness: 0.078 inch.
   3. Profile: Box profile with integral gutter, size and profile as indicated on the drawings.

D. I-Beams, C-Beams, and Box Beams:
   1. Material: Extruded aluminum conforming to ASTM B 221 (ASTM B 221M), alloy 6061-T6 or alloy 6063-T6.
   2. Profiles and structural properties: Size as indicated on drawings. Members should be sized in accordance with design data for specified performance requirements.

E. Posts:
   1. Material: Extruded aluminum conforming to ASTM B 221 (ASTM B 221M), alloy 6063-T6.
   2. Structural properties: In accordance with design data for specified performance requirements.
   3. Profile: As indicated on drawings, smooth.

F. Finish: Factory baked enamel, conforming to AAMA 603.8. Color to be selected by Architect from minimum of four choices.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are as indicated on shop drawings.

B. Installer's Examination:
   1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
   2. Transmit two copies of installer's report to Architect within 24 hours of receipt.
   3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
   4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 PREPARATION

A. Ensure that adjacent surfaces, structures, and finishes are protected from damage by construction activities of this section.

3.03 INSTALLATION

A. Install systems specified in accordance with shop drawings and manufacturer's installation instructions.

B. Placing of concrete for post bases is specified in Section 03300.

3.04 CLEANING

A. Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.

3.05 PROTECTION OF INSTALLED PRODUCTS

A. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.

B. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.

END OF SECTION

SECTION 13 34 19

PRE-ENGINEERED METAL BUILDINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-engineered, shop-fabricated structural steel building frame.

B. Insulated Metal wall and roof panels including gutters and downspouts.

1.02 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications.

B. Section 07 90 05 - Joint Sealers.

C. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCES

A. ASTM A 36 - Standard Specification for Carbon Structural Steel.

B. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

D. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

E. ASTM A 529 - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

F. ASTM A 572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

G. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

1.04 DESIGN REQUIREMENTS

A. Design members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

B. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

C. Preengineered Metal Building manufacturer is reponsible to design structure system to adequately support loads implied in these construction documents.

D. Design Calculations:

1. Submit design calculations sealed by registered Engineer indicating compliance with specified performance criteria and certified fastener pullout calculations. Indicate fastener types, spacing and number required for each clip. Pullout calculations shall be for panel clips.
2. Empirical calculations for roof panel and clip-to-panel performance will not be accepted.

E. Test Reports:
1. Submit reports from independent testing laboratory that bears stamp of registered Engineer (P.E.) to certify compliance with specified performance criteria.
2. Each pre-qualified manufacturer shall provide complete and current data for specified roof system as follows: Thermal cycle testing of metal roof panels and panel clips.
   a. Uniform ultimate wind uplift load capacity test for metal roof panels as specified.
      1) Ultimate pull-out capacity for panel clips, tested as specified.
   b. UL 90 Classification test data as specified.
   c. Static air infiltration resistance test data as specified.
   d. Water penetration test data as specified.
   e. Fastener pull-out calculations as specified.
3. Submit documentation that fasteners will provide approved UL-90 resistance or design wind uplift loads.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners.

C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

D. Samples: Submit two samples of precoated metal panels for each color selected, 4 x 6 inch in size illustrating color and texture of finish.

E. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement, and placement of components furnished for bridge crane.

F. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

G. Project Record Documents: Record actual locations of concealed components and utilities.

1.06 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
1. Conform to applicable code for submission of design calculations as required for acquiring permits.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide the following roof and wall panel warranties.
1. Minimum 20 year warranty on all pre-finished materials against chipping, cracking, crazing, blistering, peeling, chalking or fading.
2. Roof shall have manufacturers 20 NDL year water tightness warranty to include all flashing trim, and roof penetration flashings including roof curbs:

a. The manufacturer shall review project drawings and specifications before bid date to ascertain compliance of materials for accurate bidding purposes.
b. Installer, immediately upon award of bid, shall request application from manufacturer for manufacturer's Twenty (20) Year NDL watertightness warranty.
c. Installer shall complete application forms and return to manufacturer with shop drawings for review and approval well in advance of installation date.
d. After completion of project, installer shall submit letter of certification from manufacturer that roof installation is in accordance with approved shop drawings and manufacturer's requirements, and that entire roof installation will be issued the specified Twenty (20) Year watertightness warranty.

3. Five year state of Alabama General Contractors warranty as shown in section 00 50 00.
4. Wall panel and all items under this section shall be covered by pre-manufactured building warranty for a period of 10 years.
5. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

1.08 PRE-ROOFING CONFERENCE

A. A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, Alabama Division of Construction Management Inspector, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer (if applicable), and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.

B. The pre-roofing conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin.
1. This would include a detailed review of the specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

C. The following are to be accomplished during the conference:
1. Review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
2. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
3. Establish roofing schedule and work methods that will prevent roof damage.
4. Require that all roof penetrations and walls be in place prior to installing the roof.
5. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
6. Establish weather and working temperature conditions to which all parties must agree.
7. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

D. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor, the Owner, the Alabama Division of Construction Management, and the Alabama Division of Construction Management Inspector."

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pre-Engineered Buildings:
   1. American Buildings Company: www.americanbuildings.com.
   2. Butler Manufacturing Co: www.butlermfg.com.
   3. Inland Buildings: www.inlandbuildings.com.
   4. Mesco Building Solutions: www.mescobuildingsolutions.com
   5. VP Buildings: www.vp.com.
   6. Substitutions: See Section 01600 - Product Requirements.

2.02 PRE-ENGINEERED BUILDING

A. Single span rigid frame.

B. Primary Framing: Rigid frame of rafter beams and columns, end wall columns, and wind bracing.

C. Secondary Framing: Purlins, Girts, Eave struts, and Portal Frames, and other items detailed.

D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly and insulation, and accessory components.

F. Roof Slope: 1 inches in 12 inches.

2.03 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A 36 or ASTM A 572.

B. Structural Tubing: ASTM A 500, Grade B cold-formed.

C. Plate or Bar Stock: ASTM A 529, Grade 50.

D. Anchor Bolts: ASTM A 307, unprimed.

E. Bolts, Nuts, and Washers: ASTM A 325 Type 1, galvanized to ASTM A 153, Class C.

F. Welding Materials: Type required for materials being welded.

G. Primer: SSPC-Paint 20, zinc rich.

H. Grout: ASTM C 1107, Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2400 psi in two days and 7000 psi in 28 days.

2.04 MATERIALS - WALLS AND ROOF

A. Insulation: Batt glass fiber type, unfaced, ASTM E 84 flame spread index of 25 or less where exposed, friction fit, see plans for thickness.
   1. Roof insulation: 8-inch vinyl faced. R-Value: 25 minimum.

B. Wall Insulation / Vapor Barrier: To be standard 8-inch vinyl faced insualtion by pre-engineered building manufacturer. R-Value: 25 minimum.

C. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A 153, finish to match adjacent surfaces when exterior exposed.

D. Sealant: Manufacturer's standard.

E. Roof Curbs: Insulated metal same as roofing, 1-1/2 inch thick, designed for imposed equipment loads, anchor fasteners to equipment, counterflashed to metal roof system.

F. Trim, Closure Pieces, Caps, Flashings, Facias: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.05 COMPONENTS

A. Doors and Frames: Specified in Section 08 11 13.

2.06 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.

2.07 FABRICATION - WALL AND ROOF PANELS

A. Siding: Minimum 0.0254 inch metal thickness, ShadowRib profile, 3 inch deep, lapped edges fitted with continuous gaskets.

B. Roofing: Minimum 0.024 inch metal thickness, Battenlok HS profile with striations, lapped edges fitted with continuous gaskets.
   1. Roof Panels: Formed sheet panels, intended for standing seam interlocking design and trapezoidal standing seam and secured to supports with concealed structural fastener system. Roof panels are to be continuous in length, NO ENDLAPS PERMITTED.

C. Girts/Purlins: Rolled formed structural shape to receive siding, roofing sheet.

D. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with 0.024 inch thick sheet.

E. Expansion Joints: Same material and finish as adjacent material where exposed, 0.024 inch thick, manufacturer's standard brake formed type, of profile to suit system.

F. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

G. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

H. Interior Metal Panels (See drawings for locations):
   1. Provide factory fabricated formed sheet panels intended as a concealed fastener, interior composite liner, and secured to supports.
   2. Panels shall be color as selected by Architect.
   3. Finish: Embossed.
   4. Panel profile is to be Artizan Series L-12 (with Beads) or equal.

2.08 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as wall metal.

B. Form gutters and downspouts and scuppers of box profile and size indicated to collect and remove water. Fabricate with connection pieces. Systems shall include all items sized as necessary to carry off water to splash blocks or into boots.

C. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

D. Fabricate support straps of same finish as roofing metal, color as selected. Support pipe straps shall be 20 gauge metal hangers, 1-1/2" wide anchored into wall each side of down pipe. Straps

shall be minimum 8'-0" apart with minimum two per 10' section of pipe. Finished down pipe shall set away from finished wall one inch, and shall be true and plumb.

2.09 FINISHES

A. Framing Members: Clean, prepare, and shop prime (Manufacturer's Standard gray primer). Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of Kynar 500 finish, color selected from manufacturer's standard colors, but provide a minimum of 10 options.

C. Roofing: Precoated enamel on steel of Kynar 500 finish, color selected from manufacturer's standard colors, but provide a minimum of 10 options.

D. Interior Wall Panels: Siliconized Polyester,color selected from manufacturer's standard colors, but provide a minimum of 10 options.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION - FRAMING

A. Erect framing in accordance with AISC Specification for Structural Steel Buildings.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Panels shall be continuous. No end laps will be permitted in wall or roof panels.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install insulation utilizing tape mastic for attachment.

H. Install sealant and gaskets to prevent weather penetration.

3.04 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Apply bituminous paint on surfaces in contact with cementitious materials.

C. Slope gutters to drain.

D. Install splash pans under each downspout.

3.05 INSTALLATION - ACCESSORIES

A. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07 90 05.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION

SECTION 22 05 00

PLUMBING GENERAL PROVISIONS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, management, equipment, fixtures, start-up, fabrication, services, cleaning, testing and balancing required for complete installation of all plumbing provisions indicated on Drawings, Schedules and specified in this section.

B. This Contractor shall review all of the Contract Documents including all Drawings and Specifications of all Trades to ensure the complete implementation of Work.

C. Where shown or noted on the Drawings or where called for in other Sections of the Contract Documents, the Contractor for this Division shall install equipment furnished by Others, and shall make required service connections. Contractor shall verify with the supplier of the equipment the requirements for the installation.

D. Where the words "provide," "furnish," "include," or "install" are used in the Specification or on the Drawings, shall mean to furnish, install, and test complete and ready for operation, the items mentioned.

E. Drawings for the Work are diagrammatic to express the scope of the Work and to indicate the general arrangement and locations of the Work. Due to Drawings constraints, certain items such as pipe fittings, offsets, access panels, devices and sleeves may not be shown. This Contractor shall be responsible for confirming that the fixtures, piping and equipment fit the space provided. The location and sizes for pipe, fittings, sleeves, access panels and other basic items required by Code and other sections shall be coordinated and included for the proper installation of the work.

F. Specifications may not deal with diminutive installation requirements, parts, controls, and devices required which may be required to produce the equipment performance specified or as required to meet the equipment warranties and applicable Code. Such items shall be included, whether or not specifically called for in the Contract Documents.

G. Coordinate with all Trades in submittal of shop drawings. Shop drawings shall be prepared to clearly indicate all applicable components. Space conditions shall be detailed to the satisfaction of all trades, subject to review and final acceptance by the Engineer. In the event that the Contractor installs work before coordinating with other trades or so as to cause any interference with work of other Trades, the necessary changes shall be made to the work to correct, at no additional cost to the Owner, Architect or Engineer.

1.03 CONTRACTORS QUALIFICATIONS

A. The qualifications of this Contractor for shall be as follows:

1. Contractor must be a licensed contractor, specific to this section's Trade, in the project's State.
2. The Contractor shall have been in the plumbing contracting business for the last five consecutive years, under their current corporation name with more than 75% of the same corporate officers.
3. The Contractor shall have completed at least two projects of comparable size and scope within the past two years without receipt of a Notice to Cure.
4. If Contractor has received a Notice to Cure on any project, that Contractor is excluded from performing work on this project.
5. Contractor to have a minimum of 10 qualified field employees that are full time employees of the Contractor's Company and have been with the Contractor's Company full time (8 hours a day for 40 hours per week) for a minimum of 2 years. Work performed under the Contractor's Scope of Work must be performed by full time employees of the Contractor and cannot be subbed out to a 3rd Party Workforce other than those specified to be performed by a 3rd Party e.g. Medical Gas Systems Certification, Insulation and Test & Balance.
6. The Contractor's main construction and service office shall be located within 150 driving miles distance of the project site unless approval, 10 days prior to project bid date, has been issued in writing by the Owner, Architect and Engineer.
7. The Contractor shall provide substantiating proof of these requirements 10 days prior to project bid date. If substantiating proof is not submitted and approved, the Contractor will not be allowed to bid or work the project.
8. The General Contractor shall not purchase this Contractor's equipment, materials, etc. All materials, equipment, labor, etc. required to perform the Work herein shall be at the cost of this Contractor.

1.04 CODES AND STANDARDS

A. Conform to latest edition of governing codes, ordinances, adoptions and or regulations of the authority having jurisdiction. Where local codes are not applicable, conform to the latest International Code Counsel requirements.

1.05 FEES, PERMITS, AND INSPECTIONS

A. Secure all permits and pay all fees required in connection with the Work.

B. Coordinate and provide such inspections as are required by the Authorities having jurisdiction over the site.

C. Where applications are required for procuring of services to the building, prepare and file such application with the authority having jurisdiction. Furnish all information required in connection with the application in the form required by the authority having jurisdiction.

1.06 SITE INSPECTION

A. Contractor shall inspect the site to become familiar with conditions of the site which will affect this Contractor's work and shall verify points of connection with utilities, routing of Work to include required clearances from any obstacles.

B. Additional payment will not be provided for changes in the Work required because of Contractor's failure of said familiarization and understanding.

1.07 ACTIVE SERVICE

A. Existing active services are to be located and shall be protected against damage. Do not disrupt operation, functionality and cleanliness of active services which are to remain. If active services are encountered which require relocation, make request to authorities having jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in compliance with requirements of the authority having jurisdiction.

1.08 SUBSTITUTIONS

A. Any equipment, material, etc. submitted as "equal" to the basis of design shall be accompanied with a "one – to – one" comparison letter from the vender stating any differences from the equipment being submitted and the basis of design. A letter is also to be submitted from the vender, on the vender's letterhead, stating that the vender has received a copy of the job all Specifications, Addendums and Drawings.

B. Substitutions for the scheduled and specified equipment shall only be done with the prior approval of the Engineer, and shall be obtained in writing. Prior approvals shall be obtained no less than 10 days prior to the project bid date. Prior approval shall not relieve the contractor of supplying equipment that meets the specifications, capacities, efficiencies, physical dimensions, etc.

1.09 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Products specified only by reference standard, select product meeting that standard in accordance to the projects funding requirements, i.e. Made in the USA.

B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with the schedules and specifications. When three are mentioned, the 10 day prior approval is still required.

C. For products specified, noted or scheduled stating "or equivalent," "or equal" or similar wording, submit a request for proposed substitutions for any product or manufacturer which is not specifically named for review and prior approval by the Engineer.

D. For products specified by naming only one product and manufacturer, the Engineer may provide approval of a product of equal or greater quality or performance. Submittal must be received 10 days prior to project bid date accompanied with a one – to – one comparison letter.

1.10 SUBSTITUTION SUBMISSIONS

A. Each substitution submittal request shall be accompanied with:
   1. Comprehensive data proving compliance of proposed substitution with requirements stated in the contract documents:
      a. Product identification.
      b. Manufacturer's literature shall identify:
         1) Manufacturer's name, address, phone number, point of contact and email address.
         2) Product description.
         3) Reference standards.

4) Performance and test / compliance data.
5) Warranty information of all components.

c. Two projects of similar size and scope on which product has been used, date of each installation and project Owner's recommendation.
d. Itemized comparison of the proposed substitution with product specified listing any variations.
e. Changes in construction schedule.
f. How the substitution will affect other Trades.
g. List of changes required in any other work, products or required to be made by other Trades.
h. Availability of repair services, sources of replacement materials, etc.

B. Substitutions will not be considered for acceptance when:
1. Substitution requires substantial revision of contract documents.
2. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor or Supplier prior to bid.
3. Information is deemed inadequate by the Engineer necessary for complete evaluation.

1.11 CONTRACTOR'S SUBSTITUTION RESPONSIBILITIES

A. Contractor affirms that:
1. Contractor has determined that the substitution is equivalent to or superior in all respects to that scheduled and or specified.
2. Contractor will provide the same warranties, guarantees and or bonds for substitution as for product scheduled and or specified.
3. Contractor will coordinate installation of accepted substitution into the work, and will make changes as required for the work to be complete in all respects.
4. Contractor waives claims for additional costs caused by substitution.

B. The Contractor shall have included all costs associated with the substitution for the specified products or materials, and that no additional cost will be incurred by any other party in order to fully incorporate the substituted item(s).

C. The Contractor agrees to reimburse the Architect/Engineer for any architectural or engineering re-design that is required by the substitution to be fully incorporated. The reimbursement shall be at the Architect/Engineer's standard billing rate.

1.12 ENGINEER'S DUTIES

A. Notify Contractor in writing of decision to accept or reject requested substitution.

1.13 SUBMITTALS

A. General:
1. Submit to Engineer shop drawings and product data required by the Drawings and Specifications.
2. Contractor shall compile all data required to satisfy the Scope of Work implied by the Contract Documents.
3. Submit a minimum of 6 copies of data, more if required by the Architect. Coordinate with Architect and Engineer to verify if Electronic Submittals, i.e. PDF, may be allowed 10 days prior to bidding the project. If Electronic Submittals are allowed, 2 bound hard copies, as stated below must be submitted as well as the Electronic file.

B. Submittal Requirements:
1. Review shop drawings and product data prior to submission to Engineer.
2. Submit only complete project submittals. Partial submittals or submittals not complying with the above requirements shall be returned to the contractor un-marked and rejected.
3. Engineer's review is only to check for general conformance with the design concept of the project and general compliance with Contract Documents. No responsibility is assumed by the Engineer for correctness of dimensions, details, quantities, procedures, etc. shown on shop drawings or submittals.
4. In the interest of project expediency, the contractor may pre-submit long lead items for pre-approval pending prior approval of the Engineer. However, the Contractor shall not be relieved of including the same data as required by submittal binder and shall be included therein.
5. If a pre-submittal is made, provide a tab for items not included and include an explanation of why item is not included in the submittal and the expected submittal date.
6. PDF submittals must be searchable and tabbed per section. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
7. Hard copy submittals shall be compiled in a 3-ring, hard bound, loose leaf binder. The face of the binder shall be clearly marked with the project title and number, the name of the Owner, Architect, Engineer, General Contractor and this Contractor.
8. Provide an index, numerically indicating all sections applicable to the submittal.
9. Separate binders shall be provided for HVAC, Plumbing and Fire Suppression trades.
10. Provide tab dividers for each section submitted.
11. If an item appears on the drawings not specifically covered by the specifications, provide an additional numeric tab at the end of the index detailing the item and include the submittal data in the binder. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
12. All equipment included on the submittal sheets shall be marked to indicate the mark of the equipment as shown on the drawings. The equipment shall be high-lighted to clarify which items are being submitted.
13. When required, the contractor will be provided with an electronic copy of this section's Drawings. Shop drawing submittals shall consist of one digital copy in .dwg format and one in PDF format. The drawing's sheet sizes shall be formatted to the same size as the Contract Documents. A digital copy in PDF format shall be returned to the contractor with the Engineer's approval stamp and comments.
14. Verify field measurements, field construction criteria, catalog numbers, and similar data.
15. Notify Engineer in writing of deviations from requirements of Contract Documents at time submittals are made. A "deviation" shall be construed to mean a minor change to the sequence indicated on drawings or specification. A "deviation" is not intended to allow substitutions or product options.
16. Deviations in submittals from requirements of the Contract Documents are not relieved by Engineer's review of submittals, unless Engineer gives written acceptance of specific deviations.
17. Work may not commence until submittals have been returned with Engineer's stamp and signature indicating approval. Materials and equipment that were installed prior to being approved shall be removed and replaced with approved items at no additional cost to other parties.
18. Shop Drawings and or submittals requiring resubmission to the Engineer due to non-compliance with the Contract Documents and or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Engineer for review. The Contractor shall ensure the completeness and compliance of the submittal materials and shall reimburse the Engineer at the Engineer's standard hourly billing rate for review of submittals beyond the second submission.

19. Omission in shop drawings of any materials indicated in Contract Drawings, mentioned in Specifications, Scheduled or required for proper execution and completion of Work, does not relieve the Contractor from responsibility for providing such materials.

1.14 OPENINGS, CUTTING, AND PATCHING

A. This Contractor shall coordinate required openings in the structure, walls, ceiling, floor roof, etc. with all Trades and applicable Engineers.

B. When additional patching is required due to failure of coordination; provide the patching required to properly close openings including "put back" and painting. Patching must meet the Owner's, Architect's and all applicable Engineer's approval.

C. When cutting and patching of the building is required due to failure to install piping, sleeves, or equipment on schedule or failure to provide the information required for openings, provide the cutting and patching as required. Patching must meet the Owner's, Architect's and Engineer's approval.

1.15 PROTECTION

A. Equipment and material shall be completely protected from weather elements, painting, plaster, etc. until the project is completed. Damage from rust, paint, scratches, etc. shall be repaired as required to restore equipment to original condition. If repair is deemed unacceptable by the Owner, Architect or Engineer, the equipment, material, device, etc. shall be replaced with new at no additional cost to the Owner, Architect or Engineer.

B. Piping within walls, in particular within studs, shall be protected with 16 gauge metal cover plate, on both sides of stud, equal to Sampson HSS Stud Shoe.

C. Where the installation or connection of equipment requires work in areas previously finished by other Contractors, the area shall be protected and not marred, soiled, or otherwise damaged during the course of such work. Contractor shall arrange with all other Contractors for repairing and refinishing of such areas which may be damaged.

D. When welding is required inside the building, a fire watch shall be provided. The fire watch shall provide adequate protection of existing surfaces and observance of adjacent floors where penetrations exist or are to be made.

1.16 WIRING FOR EQUIPMENT

A. Division 22 shall provide all motors, controllers and contactors for equipment furnished under this Division, except where they are to be provided under another Division. Coordinate among all Trades prior to bidding project.

B. Electrical work provided under Division 22 shall conform to the requirements of Division 26.

C. Division 26 shall provide power for motors and equipment furnished by this Contractor including safety disconnect switches, starters and final connections. This Contractor is responsible for coordinating with the Electrical Contractor and all other Trades, for wiring that is beyond this Contractor's credentials.

D. Include provisions required for systems controls and integration into building Life Safety and Building Automation Systems.

E. Coordinate with Division 26 for all equipment which requires electrical services. Provide information as to the exact location for rough-in, electrical load, size, and electrical characteristics for all services required.

1.17 PROTECTION OF ELECTRICAL EQUIPMENT

A. Water piping shall not be installed in electrical rooms, unless it serves the room and meets the AHJ's requirements, or directly above electrical equipment.

1.18 EXCAVATING, TRENCHING, AND BACKFILLING

A. Provide excavation necessary for underground piping, etc. Backfill trenches and excavations after work has been installed, tested and approved. Care shall be taken in excavating, that walls and footings and adjacent load bearing soils are not disturbed, except where lines must cross under a wall footing. Where a line must pass under footing, the crossing shall be made by the smallest possible trench to accommodate the pipe. Excavation shall be kept free form water by pumping if necessary. Any open trench shall be protected with signage, fencing, etc. Trenches shall be excavated in accordance with all regulatory Codes and AHJ requirements.

B. Trenches for piping and utilities located inside foundation walls and five (5) feet outside of the exterior wall shall be not less than sixteen (16) inches or more than twenty-four (24) inches wider than the outside diameter of the pipe to be laid. The widths of trenches for piping and utilities located more than five (5) feet outside of building foundation walls, other than for sewers, shall be governed by conditions found at the site.

C. Pipes must be buried 24" (min.) to the top of the pipe. Grade the trench and provide 6" sand base for the pipe, with the body of the pipe supported. Bottoms of trenches shall be so shaped that when pipe is in place the lower fourth of the circumference for the full length of the pipe will be supported on compacted fill. Bell holes shall be dug so that no part of the weight of the pipe is supported by the bell but shall be no larger than necessary for proper jointing. All piping required for the structure shall be excavated to at least six (6) inches below pipe invert.

D. Immediately after testing and/or inspection, the trench shall be carefully backfilled with earth free from clods, brick, etc., to a depth one-half the pipe diameter and then firmly tamped in such a manner as not to disturb the alignment or joints of the pipe. Thereafter, the backfill shall be tamped every vertical foot.

1.19 CONCRETE WORK

A. Provide concrete bases and housekeeping pads for equipment unless indicated otherwise. Concrete work shall be as specified in the applicable Civil and Structural Sections. Vibration pads, equipment bases, pipe supports and thrust blocks shall be provided by this Contractor.

B. Provide equipment anchor bolts and coordinate their proper installation and accurate location.

1.20 ANCHORING OF EQUIPMENT

A. All equipment located on floor slab that is capable of being moved shall be secured to the floor with anchor bolts. A minimum of two bolts are required per each piece of equipment and bolts shall be of sufficiently size to prevent equipment from overturning.

B. Roof mounted equipment and curb shall be secured to the roof structure in compliance to ICC wind loading provisions.

1.21 ACCESS PANELS

A. Access Panel shall be of appropriate size to allow for full service and removal of device behind the access panel.

B. Provide access panels where required and not shown on the drawings for installation by the drywall or masonry Contractor. Access panels shall be steel, primed ready for paint. All access panel locations shall be approved by the Architect/Engineer.

C. Provide fire rated access panels in rated walls, ceilings and floors. Rates shall be in compliance to the assemblies rating. This Contractor shall review Life Safety Drawings for required locations of fire rated access panels.

1.22 SLEEVES

A. Sleeves passing through non-load bearing or non-fire rated walls and partitions shall be Schedule 40 PVC pipe or cast iron pipe.

B. Sleeves passing under or through load bearing walls, concrete beams, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected.

C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.

D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions, and ceilings, and shall extend 1/2" above finished floors. Extend sleeves 1" above finished floors in areas likely to entrap water.

1.23 ESCUTCHEONS

A. Provide chrome plated escutcheons at each sleeved opening into finished and exposed exterior spaces. Escutcheons shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve. Where sleeve extends above finished floor, escutcheon shall clear sleeve extension. Secure escutcheons to sleeve with set screws or other approved devices.

1.24 INSULATION PROTECTION

A. Where exposed insulated piping extends to floor, provide aluminum wrap guard around insulation. Aluminum wrap and straps shall be trimmed to eliminate sharp cutting edges.

1.25 CONNECTIONS FOR FIXTURES AND EQUIPMENT UNDER ANOTHER SECTION OR BY OWNER

A. Rough all equipment requiring connection to systems provided under this Division. Verify requirements and current locations before proceeding with work.

B. Make all connections to equipment furnished under another Section or by the Owner as required to obtain complete and working systems.

1.26 TEST AND DEMONSTRATIONS

A. Systems shall be tested and placed in proper working order prior to demonstrating systems to Owner.

B. Prior to acceptance of the installation, demonstrate to the Owner representative all features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems. The Contractor shall allow for five working days and all required tools, devices, etc. to perform the demonstrations / instructions.

C. Provide necessary trained personnel to perform the demonstrations and instructions. Provide manufacturer's representatives for systems as required to assist with the demonstrations.

D. Dates and times for performing the demonstrations shall be coordinated with the Owner.

E. Upon completion of demonstrations, provide a certificate testifying that demonstrations have been completed. Certificate shall list each system demonstrated, dates demonstrations were performed, names of parties in attendance, and shall be signed by the Contractor and Owner.

1.27 OBSERVATIONS OF WORK

A. The Contractor shall schedule an observation, performed by the Engineer and AHJ, one week in advance of the observation, prior to any Work being concealed, covered, etc.

B. If the Contractor schedules an observation and the Work is found not ready or not per the Contract Documents by the Engineer, the Contractor shall reimburse the Engineer, at the Engineer's standard hourly rate, including travel time, for a follow up observation.

C. A copy of the AHJ's report for any work observed or inspected by the AHJ shall be submitted to the Architect and Engineer.

1.28 OPERATING AND MAINTENANCE MANUALS

A. General:
   1. Provide three "As Built" copies of shop drawings, product data, and other information described in this Section for use in compiling operating and maintenance manuals.
   2. Provide legible submittals made by permanent reproduction copy equipment from typewritten or typeset originals.
   3. Pre-punch 8-1/2 inch x 11 inch sheets in three ring, hardback, binders.
   4. Submit larger sheets in rolled, protected packages.
   5. Submit all in a PDF format as well as the hard copy sets mentioned above.

B. Compilation:
   1. The Contractor will compile shop drawings, brochures, materials lists, technical data, warranties, guarantees, and other pertinent information and will assemble, catalog, and file information in loose-leaf, hardback three-ring binders.
   2. Submittal Format: Provide each of the following items, as applicable, for each required item or system. Refer to specific Specification section requirements.
      a. Item: Use appropriate Section title.
      b. System Description: Provide a detailed description of each system, describing function, components, capacities, controls and other data specified, and including the following:
         1) Quantity.
         2) Sizes.

3) Operation.
4) Detailed operating instructions, including start-up and shut-down of each system, with indications for position of all controls, as applicable.
5) Wiring Diagrams: Complete wiring diagrams for internally wired components including controls.
6) Operating Sequence: Describe in detail.
7) Manufacturers Data: Provide catalog data sheets, specifications, nameplate data and parts list.
8) Preventative Maintenance: Provide manufacturer's detailed maintenance recommendations.
9) Troubleshooting: Provide manufacturer's sequence for trouble-shooting procedures for operational problems.
10) Extra Parts: Provide a listing of extra stock parts furnished as part of the Contract.
11) Warranties: Provide specific manufacturer's warranty. List each component and control covered, with day and date warranty begins, date of expiration and name, address and telephone number of person to contact regarding problems during warranty period.
12) Directory: Provide names, addresses, emails and telephone numbers of Contractor, its subcontractors, suppliers, installers and authorized service and parts suppliers.

1.29 RECORD DRAWINGS

A. The Contractor shall record the exact locations, as installed, all equipment, pipes, and vents whether concealed or exposed which were not installed exactly as shown on the contract drawings.

B. Upon completion of the work, this data shall be recorded to scale, by a competent CAD operator in .dwg format of no more than two versions past current. Electronic drawings in .dwg format will be furnished to the Contractor by the Architect/Engineer. Where the work was installed exactly as shown on the contract drawings the .dwg file shall not be disturbed other than being marked "As-Built." In showing the changes, the same legend shall be used to identify piping, etc., as was used on the contract drawings. Separate electronic drawings shall be prepared for plumbing, heating, air conditioning, and ventilating work unless two or more divisions are shown on the same sheets of the contract drawings, in which case the various subcontractors shall also show their changes on the same sheets. Each sheet shall bear the date and name of the Contractor submitting the drawings.

C. The Contractor shall review the completed As-Built drawings and ascertain that all data furnished on the .dwg files is accurate and truly represent the work as actually installed. Where plumbing, hot or chilled water pipes, inverts etc., are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced by using the original bench mark used for the institution or for this project.

D. The Contractor shall not distribute the Drawings without the expressed written consent of the Engineer. The Engineer shall authorize the Contractor to produce and distribute the As-Built drawings as follows:
1. One (1) to the Engineer.
2. One (1) to the Architect.
3. One (1) to the Owner.

1.30 SYSTEM GUARANTEE

A. Work required under this Division shall include a minimum one-year guarantee or longer where scheduled or specified elsewhere in the Contract Documents to be duration scheduled or specified. Guarantee by Contractor to Owner to replace any defective workmanship or material which has been furnished under this contract at no cost to the Owner, Architect or Engineer for a period of one year, or longer if so specified in other sections or schedules in the Contract Documents, from date of Substantial Completion. Guarantee shall also include all reasonable adjustments to system required for proper operation during guarantee period. Guarantee shall not include normal preventative maintenance services or filters.

1.31 PAINTING AND IDENTIFICATION

A. Touch-up paint where equipment has sustained "minor" damage shall be applied with factory provided paint and finish, to match original finish. Damaged shall only be deemed "minor" by the Engineer's assessment.

B. Provide engraved, laminated plastic tags for all equipment. Tags shall be attached with permanent adhesive or pop-rivet(s).

1.32 FINISHING

A. Prior to acceptance of the installation and final payment of the Contract, the Contractor shall perform the work outlined in the Contract Documents.

B. At the conclusion of the construction, all portions of the project work shall be cleaned thoroughly of all debris and unused materials remaining from construction.

C. Equipment and piping systems shall be cleaned internally. The Contractor shall open all dirt legs and remove strainers / filters, completely blowing down as required and clean strainer screens of all accumulated debris. Finished strainers, sized by the manufacturer shall be installed in place of startup strainers, filters, etc.

D. All tanks, fixtures, and pumps shall be drained and proven free of sludge and accumulated matter.

E. All temporary labels, stickers, etc., shall be removed from all fixtures and equipment. (Do not remove permanent name plates, equipment model numbers, ratings, etc.). Painting over equipment nameplates will not be allowed. Nameplates will be replaced with new if damaged or painted over. All equipment shall have affixed adjacent to the permanent nameplate, the unit identification on an engraved label with permanent adhesive or pop-rivet(s).

F. Plumbing fixtures, equipment, tanks, pumps, etc., shall be thoroughly cleaned externally as well.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 22 05 32

SUPPORTS AND ANCHORS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration and services required for complete installation of all supports and anchors indicated on Drawings and specified within this section.

B. Vent piping, water and waste piping, vent piping appurtenances, hangers, supports and required anchors.

C. Equipment bases, frames and supports.

D. Flashing and sealing equipment and pipe penetrations.

E. Sleeves and seals.

1.03 REFERENCES

A. American Society of Mechanical Engineers (ASME)

B. American Society of Testing and Materials (ASTM)

C. National Fire Protection Association (NFPA)

1.04 WORK FURNISHED, INSTALLED UNDER OTHER SECTIONS

A. Furnish hangers and sleeve inserts for placement into formwork, framework, structure, slab, etc.

1.05 SUBMITTALS

A. Submit shop drawings and product data for all items listed under this section.

B. Indicate hanger / support framing and attachment methods.

C. Provide hanger / support framing loading limits, location and load of each hanger / support frame.

1.06 SITE CONDITION

A. Do not drill, cut, burn or weld structural members in connection with the installation of pipe supports, bracing and anchorage devices, unless proposed in writing and approved in writing by the Engineer.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Sleeves Through Interior Walls, Floors and Ceilings:
   1. Sleeves through Non-Fire Rated floors: Schedule 40 PVC pipe.
   2. Sleeves through Non-Fire Rated walls, footings, and foundation walls: Schedule 40 PVC 2 pipe sizes larger than service pipe.
   3. Sleeves through beams shall be only in locations and of construction approved by the Structural Engineer.
   4. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 23 05 60.

B. Sleeves Through Exterior Below Grade Walls, Floors and Ceilings:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe.

C. Sleeves Through Exterior Above Grade Walls:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe. Sleeve shall extend 1/8” past finished interior and exterior of wall assembly and painted to match finished wall. Sleeve shall be sealed weather tight.

D. Escutcheons:
   1. Public Areas: Solid plate stainless steel with satin finish.
   2. Non-Public Areas: Split ring chrome plated with set screws.
   3. Size: Minimum one inch annulus shall be provided except at building seismic joints. Building seismic joint pipe sleeves shall be minimum of 5 inches greater than the nominal diameter of the pipe.

2.02 FABRICATION

A. Size pipe sleeves large enough to allow for movement due to expansion and contraction and continuous insulation.

2.03 FLASHING

A. Metal Flashing: paint grip galvanized steel.

B. Lead Flashing: 5 lb/ft^2 sheet lead for waterproofing.

C. Caps: 20 gauge minimum galvanized steel; minimum 16 gauge at fire resistant elements or as required per assembly rating. Caps shall be paint grip when exposed.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide pipe hangers, supports and guides hot-dip galvanized unless otherwise indicated. Provide copper-plated hangers on un-insulated copper pipes.

B. Hangers and support components shall be factory fabricated materials designed.
   1. Components shall have hot dipped galvanized coating; electroplate is not acceptable.
   2. Strap type hangers shall not be used on any piping system; use only clevis type. The clevis hanger fastener nuts shall be nylon lock type.

C. Anchors for pipe hanger and supports shall be either of the following types as applicable to installation condition:
   1. Galvanized metal inserts cast into concrete at time of placing.
   2. Anchor bolts for floor mounted equipment may be of a type to be placed in drilled holes and set in place with high strength cement grout.
   3. Wedge type, type 316 stainless steel, expansion bolts, anchor bolts set in drilled holes in accordance with manufacturer's instructions. Use of drop-in anchors are prohibited.

2.05 TYPES OF HANGERS

A. Hangers for Cold Pipe: Carbon steel, adjustable clevis.

B. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable clevis.

C. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Vertical Support: Steel riser clamp.

F. Copper Pipe: Carbon steel rings, adjustable, copper plated.

G. Hanger Rods: Mild steel continuous threaded.

H. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms. Size inserts to suit threaded hanger rods.

2.06 ANCHORS AND ANCHORAGE DEVICES

A. Anchors and Bolts: Bolts and studs, nuts and washers shall be Type 316 stainless steel.

B. Fasteners and Accessories: Provide anchors and fasteners, washers, straps and accessories required for a complete and finished installation. Fasteners shall be Type 316 stainless steel.

C. Expansion Bolts: Where anchors are not included in the concrete or masonry construction, anchors shall be Type 316 stainless steel screws or bolts with expansion-shield type concrete or masonry anchors, of sizes and types indicated or required.

2.07 FINISH

A. Concealed: Provide rust inhibiting primer coat to all support, hanger, anchor, etc.

B. Exposed: Provide rust inhibiting primer coat and two finish coats, color to be selected during the submittal phase, to all support, hanger, anchor, etc.

PART 3 EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

Pipe Size	Maximum Hanger Spacing	Hanger Diameter
1/2" – 1-1/4"	6'-6"	3/8"

1-1/2" – 2"	10'-0"	3/8"
2-1/2" – 3"	10'-0"	1/2"
4" – 6"	10'-0"	5/8"
PVC (all)	4'-0"	3/8"
Pex (all)	2'-8"	3/8"
Cast Iron (all)	5'-0"	5/8"

B. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.

C. Place a hanger within 12" of each elbow.

D. Use hangers with 1-1/2" minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub.

F. Support vertical piping at every floor or every 10 feet whichever is more frequent.

G. Support vertical cast iron pipe at each floor at hub.

H. Support riser piping independently of connected horizontal piping.

I. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

J. All hangers, hanger rods, supports, etc. shall be double-nutted.

3.02 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete type, minimum 6" thick with 4" A.F.F.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed in accordance with the vibration isolation manufacturer's requirements.

3.03 FLASHING

A. Flash vent and soil pipes projecting 3" minimum above finished roof surface with lead worked 1" minimum into hub, 8" minimum clear on sides. Turn flanges back into wall and caulk, metal counter flash and seal pipes through outside walls.

B. Flash floor drains with lead 10" clear on sides. Fasten flashing to drain clamp device.

3.04 SLEEVES

A. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

B. Install escutcheons as described above.

END OF SECTION

SECTION 22 05 53

PLUMBING IDENTIFICATION

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration and services required for complete installation of all plumbing identification indicated on Drawings and specified within this section.

B. Identification of domestic cold, hot, recirculating water, deionizer water, industrial water, non-potable water, sanitary drain, sanitary vent, acid waste, acid vent and rain leader piping systems.

C. Provide label maker stickers on the ceiling grid main under a water heater, pump, valve, etc. location indicating it service and / or system served. Coordinate with the Architect prior to label installation.

1.03 SUBMITTALS

A. Submit samples and manufacturer's installation instructions for all identification products used.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe Markers:
   1. Equal to Seton Snap Around Pipe Markers. Acrylic plastic with UV inhibitors. Markers shall indicate direction of flow. Legends shall be alternately reversed and repeated for viewing from any angle. Markers shall be factory formed for the installed diameter.

B. Valve Markers:
   1. Engraved Metal Tack Markers shall be provide and pop riveted to the Tee Bar main for use of identifying valve locations above acoustical tile ceilings. Color to be selected by submittal. Markers shall be numbered with standard 3/16" characters.
   2. Valve tags shall be Seton, 2” stamped brass tags with chain. Tag shall indicate floor served and service of respective valve.

PART 3 EXECUTION

3.01 PIPING

A. Piping shall be identified at maximum 20 feet intervals, at each side of floor / wall penetration, and at each valve. Piping identification shall include type of service, size of pipe and direction of flow.

B. Piping shall be marked by the following schedule:
   1. Domestic Cold Water: White letters on Green.
   2. Domestic Hot Water: Black letters on Yellow.
   3. Hot Water Recirculating: Black letters on Yellow.
   4. Non-potable Water: Black letters on Yellow.
   5. Industrial Water: Black letters on Yellow.
   6. Sprinkler Water: White letters on Red.
   7. Natural Gas: Black letters on Yellow.
   8. Sanitary Drain: White letters on Green.
   9. Sanitary Vent: White letters on Green.
   10. Roof Drain: White letters on Green.
   11. Compressed Air: White letters on Blue.
   12. Acid Waste: Black letters on Orange.
   13. Medical air: Black letters on Yellow.
   14. Nitrogen: White letters on Black.
   15. Nitrous Oxide: White letters on Blue.
   16. Oxygen: White letters on Green.
   17. Medical / Surgical Vacuum: Black letters on White.

END OF SECTION

SECTION 22 07 10

INSULATION FOR PLUMBING SYSTEMS

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.

1.02 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment, administration and perform all operations required for the correct fabrication and installation of thermal insulation applied to the following piping systems indicated on Drawings and Specifications.

B. Insulation work shall be performed by a competent insulation contractor whose primary business is the installation of insulation systems and who has been in this type of insulating business for a minimum of five years.

C. Work of this section shall include the insulation for the following plumbing systems that may or may not be present on this project:
1. Domestic cold, hot, hot water recirculating water and non-potable water.
2. Hot water piping below grade.
3. Rain Leaders including Emergency Rain Leaders.
4. Traps, trap arms, cold and hot water supplies.
5. Traps on condensate receiving floor / hub drains systems above grade.
6. Heated or chilled equipment.

1.03 SUBMITTALS

A. Submit product literature for each insulation and finish type, for material and or equipment served. Submit installation requirements for each type of insulation used.

B. Product samples shall be provided at the discretion of the Engineer.

1.04 SYSTEM PERFORMANCE

A. Insulation materials furnished shall meet the minimum thickness requirements of ASHRAE 90.1

PART 2 PRODUCTS

2.01 THERMAL INSULATION

A. All insulating systems shall be tested on a composite basis in accordance with:
1. ASTM E-84
2. NFPA 255
3. UL 723

B. All material shall be finished having a maximum flame spread rating of 25 and a maximum smoke developed rating of 50.

C. Interior Piping:
1. Rigid Fiberglass equal to Owens Corning - Fiberglas ASJ and SSL II adhesive closure system.
2. Closed cell, flexible electrometric thermal insulation, black in color, supplied in unslit tubing, equal to Armaflex AP 2000. Thickness shall be in accordance with ASHRAE 90.1.

D. Interior fittings on 1/2 and 3/4 inch pipes and accessories may use job built mitered fittings of similar material as piping. Valves and fittings 1 inch and up shall use molded preformed fiberglass fittings sized for the fitting or device being insulated. All fittings and devices being insulated shall be covered with a preformed, white, snap-on type, molded PVC jacket cover. Fittings and accessories to be covered include, but not limited to, 45 and 90-degree elbows, tees, reducers, increasers, valves, check valves and unions.

E. Equipment, tanks, etc. shall be insulated with closed cell, flexible electrometric thermal sheet insulation, black in color, equal to Armaflex AP 2000. Thickness shall be in accordance with ASHRAE 90.1.

F. Above ground exterior piping shall be equal to Foamglass with 0.29K factor @ 75°F, maximum service temperature of 900°F and 7.5 lb/ft^3 density equal to Pittsburgh Corning system with factory formed aluminum jacket.
1. Fittings for above ground exterior piping shall be machine formed, routed and fitted for specific size fitting.

G. Below ground / below slab piping shall be of same materials as F except without aluminum jacket.

2.02 INSULATION FINISH MATERIALS

A. White All Service Jacket (ASJ).

B. Glass fabric equal to Foster Mast-A-Fab.

C. Smooth Aluminum 0.016-inch thickness and 0.032 inch thickness for exterior use.

D. Aluminum fittings for elbows, tees and devices, precision formed, smooth and mar-free finish, 0.024 inches thick.

2.03 ADHESIVES

A. An air-drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000 equal to Armstrong 520 Adhesive.

2.04 FINISHES

A. A white elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel; equal to WB Armaflex Finish.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All materials shall be applied by workmen skilled in this trade. Unsightly work shall be cause for rejection.

B. Work shall be fastened, joined, adhered per the manufacturer's requirements.

C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.

D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and three times the pipe diameter in length shall be installed at hangers. Provide 18 gauge, 180 degree, galvanized sheet metal saddles under glass block supports.

E. All joints, laps, breaks, and faults in vapor barriers of insulations covering cold surfaces, shall be thoroughly sealed.

F. Insulation that becomes wet for any reason shall be removed, replaced and resealed at the expense of this Contractor.

G. Piping systems requiring testing to be witnessed by the Engineer shall not be insulated until such systems have been tested and approved.

H. Do not insulate any moving parts, valve handles, etc.

3.02 APPLICATION

A. Cold Water Insulation Application Schedule:

Pipe Size	Interior Space	Exterior Above Grade	Below Grade / Slab
1/2" – 1-1/4"	1/2"	1-1/2"	1-1/2"
1-1/2" and above	1"	2"	2"

B. Hot Water Insulation Application Schedule:

Pipe Size	Interior Space	Exterior Above Grade	Below Grade / Slab
1/2" – 1-1/4"	1"	1-1/2"	1-1/2"
1-1/2" and above	1-1/2"	2"	2"

C. Rigid Fiberglass Insulation (For interior domestic cold, hot and recirculating):
1. Piping: All insulation shall be butted together and securely stapled in place (if required by the manufacturer) with outward clinching staples on 3" centers on the lapping seams. Factory provided laps of ASJ tape of same type as jacket on insulation shall be used on joints.
2. Fittings: Fittings shall be molded fiberglass with snap on PVC jacket and matching white tape on adjacent pipe insulation.
3. Insulation joints and buts shall be beveled at 30 degrees and sealed with two coats Childers CP-30.

D. Rain Leaders and/or Emergency Rain Leaders:
1. Insulation Thickness Schedule:

Pipe Size	Exposed Conditioned Space	Exposed Non-Conditioned Space	Concealed within Building Insulation Barrier	Concealed Outside Building Insulation Barrier

3” and 4”	1”	1-1/2”	1”	2”
6” – 10”	1”	1-1/2”	1”	2”
12” – 16”	1”	1-1/2”	1”	2-1/2”
18” – 24”	1”	1-1/2”	1”	2-1/2”

2. Rain leaders and emergency rain leaders all portions, horizontal and vertical, are to be insulated. Insulation will continue up to the roof drain hub. The roof drain hub and pan and any area surrounding the roof drain exposed shall be insulated by this Contractor.
3. Piping: All insulation shall be butted together and securely stapled in place (if required by the manufacturer) with outward clinching staples on 3" centers on the lapping seams. Factory provided laps of ASJ tape of same type as jacket on insulation shall be used on joints. Exterior insulation shall be FoamGlas with aluminum jacketing.
4. Fittings: Fittings shall be molded fiberglass with snap on PVC jacket and matching white tape on adjacent pipe insulation.
5. Roof drain hubs and pans to be insulated. Miter cut the insulation to fit and glue into place.
6. Insulation joints and buts shall be beveled at 30 degrees and sealed with two coats Childers CP-30.

E. Traps on Condensate Receiving Floor Drains Above Grade:
1. Insulation shall be cut and formed to the contours of the hub and wrapped around pipe. Factory adhesive shall be used to seal the mitered joints and connection.

F. Storage Tanks:
1. Hot water storage tanks shall be wrapped with Owens Corning Flexwrap insulation. Cut the insulation and strip off a 3" wide strip for the overlap. Wrap the insulation around the tank and verify that the insulation is butted. Attach the 3" wide overlap with outward clinching staples spaced 3 inches O.C. Cut neatly for all penetrations and seal off any tears, joints or staples with ASJ jacket tape of same materials.

G. Hot Water Piping Below Grade:
1. Provide Foamglass insulation for underground hot water piping as specified above. Underground piping insulation shall be applied over a clean dry surface.
2. Underground fittings shall be installed as described above.

H. Cold, Hot Water, Hot Water Re-Circulating, Non-Potable Water, Rain Water and Waste Piping Above Exterior Grade Exposed and Concealed:
1. Above grade exterior cold and hot water shall be insulated with Foamglass as specified above.
2. Piping: All insulation shall be applied over a clean dry surface. Factory provided laps of ASJ tape of same type as jacket on insulation shall be used on butt joints. All laps and penetrations shall be sealed with a vapor barrier mastic finish.
3. Fittings: Fitting insulation shall be covered with two coats of vapor barrier mastic.
4. All above grade exterior piping shall be covered with aluminum jacketing. Aluminum shall be applied to a clean dry surface. Overlap butt joints 4" and apply 1/2" wide bands of aluminum on 8" O.C. and at each end of fittings. On exterior piping, the longitudinal seam shall be located at the bottom center of piping and turned 1/4" down for a drip edge. All joints on exterior piping shall be made water tight with exterior grade silicone caulking.

I. All interior exposed piping and fittings shall be wrapped with PVC insulating jacketing equal to Pittsburg Corning Zeston 2000 and Zeston 300.

3.03 MISCELLANEOUS

A. This Contractor will contact the Engineer prior to start of all phases of work as follows:
   1. Installation of underground insulation.
   2. Exterior above grade installation.
   3. Interior insulation installation.

B. The Engineer will ascertain the continuation of work subject to the requirements aforementioned.

END OF SECTION

SECTION 22 11 10

DOMESTIC WATER PIPING

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration and services required for complete installation of all domestic water piping indicated on Drawings and specified in this section.

B. Work to Include: All domestic water service and piping to all fixtures and equipment.

1.03 REFERENCES

A. All plumbing Work shall be in accordance with the latest edition of governing codes, ordinances, and or regulations of city, county, state, utility provider, and or authority having jurisdiction. Where local codes are not applicable, conform to the latest International Code Counsel requirements.

1.04 SUBMITTALS

A. Submit complete product and performance data for all materials listed under this section.

B. All materials shall be new, without defect, unless specifically noted or specified otherwise.

C. The supplier, by submitting, certifies the materials and equipment to be satisfactory for the application of this Work.

D. Contractor agrees that if deviations, discrepancies or conflicts between submittals and the Contract Documents are discovered either prior to or after submittals are processed by the Engineer, the Contract Documents shall supersede.

PART 2 PRODUCTS

2.01 DOMESTIC WATER PIPING SYSTEM

A. All plumbing systems shall be equipped with a pressure reducing valve at the building's water service entry. Pressure reducing valve and accessories is specified below.

B. Buried, Exterior:
   1. Copper Pipe, 3-1/2" and Smaller: Type K hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass.
      a. Joints: Hard temper with brazed joints.
   2. Ductile Iron Pipe, 4" and Larger: Cement lined, per ANSI/AWWA C151/A21.51.
      a. Joints: Shall be mechanical type.

3. Buried, Exterior:
   a. Polypropylene Pipe (All Sizes):
      1) Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Domestic hot water and heating piping shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
      2) Underground Piping: Polypropylene (PP-R) piping in SDR 7.4.
      3) Install hangers and supports at intervals specified in the applicable Mechanical Code and as recommended by pipe manufacturer.
      4) Support vertical piping at each floor and as specified in the applicable Mechanical Code.
      5) Fire stopping shall be provided to both be compatible with the Aquatherm Piping and meet the requirements of ASTM E 814 or ULC S115, “Fire Tests of Through-Penetration Firestops”. Pipe insulation shall be terminated 3 to 6 inches from where the pipe passes through a fire stop, as recommended by the fire stop manufacturer.
      6) Pipe shall be Greenpipe available from Aquatherm, Inc. or prior approved equal.
      7) Fittings:
         a) Fittings shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.
         b) Install fittings and joints using socket-fusion, elecrofusion, or butt-fusion as applicable for the fitting type. All fusion-well joints shall be made in accordance with the pipe and fitting manufacturer’s specifications and product standards.
         c) Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.
         d) Prior to joining, the pipe and fittings shall be prepared in accordance with F 2389 and the manufacturer’s specifications.
         e) Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer’s specifications.
         f) Fittings shall be Greenpipe available from Aquatherm, Inc. or prior approved equal.
      8) Valves:
         a) Valves with PP-R bodies shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The valves shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
         b) Valves with brass bodies shall be manufactured in accordance with the manufacturers specifications and shall by certified by NSF International as complying with NSF 61.
         c) Valves shall be Aquatherm® Fusiotherm® available from Aquatherm, Inc. or prior approved equal.

9) Warranty:
   a) Manufacturer shall warrantee pipe and fittings for 10 years to be free of defects in materials or workmanship.
   b) Warrantee shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system do to defects in materials or workmanship.

b. Testing: Testing shall be performed, documented and submitted per the manufacturer's requirements.

C. Buried Below Slab:
1. Copper Pipe: Type K soft copper per ASTM B-88 with continuous protective plastic cover.
   a. Fittings: Wrought copper or lead free cast brass.
   b. Joints: All joints below slab shall be hard temper with brazed joints.
2. PEX Piping:
   a. PEX-A piping (SDR9 crosslinked polyethylene manufactured using the Engel method) shall be acceptable if the following is met: (Note: Clip Ring PEX will not be allowed).
      1) Minimum degree of cross-linking shall be between 70-89% when tested in accordance with ASTM D2765, Method B.
      2) Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent, third-party agency.
      3) Piping to have a minimum material designation of PEX 5106.
      4) Potable water piping shall comply with NSF 14 and NSF 61 and bear the "NSF-pw" marking.
      5) Temperature and pressure requirements in accordance with PPI TR-3: 73.4°F at 80psi, 180°F at 100psi and 200°F at 80psi.
      6) Pipe shall be PEX-A ProPex available from Uponor or prior approved equal.
   b. Joints: Manufactured Joints shall be ASTM F1960 cold-expansion type and must comply with the following:
      1) 20% glass-filled polysulfone as specified in ASTM D6394
      2) Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D6394
      3) Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D6394
      4) Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D6394
      5) Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping and marked "F1960".
      6) Potable water fittings shall comply with NSF 14 and NSF 61 and bear the "NSF-pw" marking.
      7) All threaded fittings shall be lead free brass.
      8) Fittings shall have the same inside diameter as the piping.

D. Above Grade:
1. Copper Pipe: Type L hard drawn copper per ASTM B-88.
   a. Fittings: Wrought copper or cast brass.
   b. Solder: Lead-free, tin-silver solder.
   c. Notes:
      1) Mechanically formed pull Tees and field brazed Tee connections will not be allowed on metallic piping. All fittings must be factory fabricated.
      2) Copper press fittings on above grade copper piping will be allowed. System shall be Viega "Pro-Press" system, factory copper fittings with EPDM 'O' rings secured with factory approved crimping tools, jaws and crimp rings.

2.02 DIELECTRIC FITTINGS

A. Insulating Material: Suitable for system fluid, pressure, and temperature.

B. Dielectric Unions, Nipples, Couplings and Flanges:
1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. Retain one of two subparagraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
2. Shall be of brass material rated for applicable service. Dielectric fittings with EDPM type materials will not be allowed. The fitting will be all brass compression type.

2.03 DOMESTIC WATER SPECIALTIES

A. Pressure Reducing Valves (PRV): All plumbing systems shall be equipped with a pressure reducing valve at the building's water service entry. PRV shall be equal to Zurn model ZW209BP, Lead Free compliant with Low Flow bypass and control for 1 gpm continuous minimum flow. PRV to be sized to have not more than 5 psi through the valve at maximum continuous flow. PRV shall be line size unless otherwise noted. Provide full port ball valve, union and strainer at inlet of PRV and union and full port ball valve at outlet of PRV.

B. Backflow Preventer (BFP): All plumbing systems shall be equipped with a lead free backflow preventer at the building's water service entry. BFP shall be equal to Watts LF007 with strainer and shall be line size unless otherwise noted.

C. Vaults (if called for on the drawings) shall be as manufactured by Eagle Wholesale series 9648, 96" x 48" x 48" deep (unless a different length is provided on the drawings), pre-cast reinforced concrete vault. Frame and lid to be Eagle series 9648 with optional hydraulically assisted two-piece aluminum doors. Door locks and hinges to be stainless steel. Frame channel to be self-draining to grade. Drain to be installed from the frame channel horizontally thru the side of the vault. Vault shall be factory fitted with the backflow preventer and pressure reducing valve and piping thru the vault walls for connection by the Plumbing Contractor. Pipes within the vault to be class 350 cement lined ductile iron. Vault installation shall be as detailed on the drawings. Permanent ladder / steps shall be provided within vaults deeper than 4 feet below grade.

D. Water Hammer Arrestors (WHA): ASSE 1010; sized in accordance with PDI WH-201, piston type, suitable for operation to 250°F a maximum working pressure of 350 psig. WHA shall be Sioux Chief 650 series or prior approved equal.

E. Provide circuit setters equal to Circuit Solver stainless steel thermostatic balancing valve.

F. Hot water recirculation pump(s) shall be Bell & Gossett model ecocirc XL 15-75 lead free bronze body with stainless steel impeller and shaft, 1/6 HP 120/1V, 0.1 to 2.3 Amps.

G. Thermal Expansion Tanks: Amtrol model Therm-X-Trol, or prior approved equal, bladder or diaphragm type, rated for potable water systems. Size shall be as Scheduled or indicated on the Drawings. Tank shall be ASME rated whenever the water heater or storage tank for the respective hot water system is indicated to be ASME rated.

H. Gauge Cocks shall be brass valves with 1/4" NPT female connections and handles. Valves shall be suitable for 200 psi. Gauge Cock shall be Trerice model 865 or equal.

I. Pressure gauges shall have type 316 stainless steel interior and exterior construction. Windows shall be glass. Gauges shall have 4" dials with white faces and black graduations.

Gauge ranges shall be selected so that the normal operating point is approximately 50% but shall not exceed 75% of scale. Unit of measure shall indicate psi. All gauges shall be provided with a pulsation damper, snubber or similar device to dampen pulsation surges. Gauges shall have 1/4" NPT bottom outlets. Weiss style NF4S-2 or prior approved equal.

J. Thermometers shall be Weiss model DVU35 or prior approved equal. Thermometer case shall be constructed of hi-impact ABS, 3/8" LCD digits, wide ambient formula, 1% of reading or 1° accuracy whichever is greater, resolution shall be 1/10° between -19.99/199.9°F, 10 second update, ambient operating range -30/140°F, glass passivated thermistor. Thermometer stem assembly shall be ASME B40.3 compliant. Sockets on insulated pipes shall have extensions of adequate length to clear insulation.

K. Service valves 1/2" thru 4" shall be full port 1/4 turn brass ball valves, two-piece construction, threaded end connection, with PTFE seats and seals, adjustable stem packing gland, stem o-ring and steel handle with vinyl sleeve. 1/2" thru 2" valves shall be pressure rated at 600 psi WOG and 150 psi WSP. 2-1/2" and 3" valves shall be pressure rated at 600 psi WOG and 125 WSP. Valves shall be Kitz series #58 or prior approved equal. All valves shall be furnished with valve handle extensions.

L. Check valves shall be bronze body horizontal swing wye-type with renewable seat and disc, screw cap, threaded end connections, pressure rated at 200 psi non-shock cold working pressure. Valves shall be Nibco T-413-Y-LF or prior approved equal.

M. Strainers shall be bronze body with tapped retainer cap and closure plug, threaded end connections, 20 mesh strainer screen, pressure rated at 400 psi WOG and 125 psi WSP. Strainers shall be Watts series LF777 or prior approved equal.

N. Piping inside chase areas shall be supported with bracketing system equal to Sioux Chief Grid Iron series. System shall include, but not be limited to, a center span bracket, two end bracket clamps and necessary retaining brackets to support the copper piping. Where piping is supported off the vent system, the vent piping shall be bracketed to the inside chase wall. Stainless steel clamps shall be incorporated into the support system when connections are made to the PVC piping.

2.04 P & T RELIEF PIPING

A. Above Slab:
1. Copper Pipe: Type L hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Solder: Lead-free, tin silver solder.
2. Relief piping terminating outside the area of the installed water heater shall be installed with an air gap. The air gap shall be Watts model 909, 1" in-line type, and installed at the water heater below the T & P relief valve.

2.05 PRIMER DRAIN PIPING (WHEN APPLICABLE)

A. Above Slab:
1. Copper Pipe: Type L hard drawn copper per ASTM B-88.
   a. Fittings: Wrought copper or cast brass.
   b. Joints: Lead-free, tin-silver solder.

B. Below Slab:
1. Copper Pipe: Type L soft drawn copper with no fittings or joints below the slab. Provide continuous protective plastic covering.

PART 3 EXECUTION

3.01 GENERAL

A. Work shall be installed so that all exposed piping will be straight and true without bends or off-sets.

B. Water supplies shall connect through walls with stops and chrome plated escutcheons with setscrews. Split ring escutcheons will not be allowed.

C. Installation dimensions shall be taken from the Architectural Drawings.

3.02 DOMESTIC WATER PIPING

A. Provide a complete domestic water piping system including interior and exterior work as indicated.

B. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor.

C. Piping shall be accurately cut to measurements established at the project site, worked into place without springing or forcing, run as directly as possible, run parallel or perpendicular to building lines, located as indicated on the Drawings and supported as specified elsewhere. Parallel piping shall be grouped together as much as practical. Piping shall be supported as high as practical. Piping shall be concealed unless noted otherwise.

D. Contractor shall provide for expansion and contraction of piping systems. Expansion and contraction of piping shall not impart excess stress or strain on the building, pipe fittings, joints or connections to equipment.

E. Provide sleeves for all piping penetrations under or through footings, foundation walls, grade beams, floors above grade and walls. Sleeves for insulated piping above grade shall be sized for the insulation diameter. Annular space between the insulation and sleeve shall be sealed or fire caulked as detailed on the drawings. Sleeves shall be 2 pipe sizes larger than the service pipe.

F. Piping thru slabs on grade shall be protected with 1/2" thick Armaflex closed cell foam insulation a minimum of 6 inches above and below slab. Wrap all pipes below slab in an approved jacketing material.

G. Piping installed below grade shall have a minimum of 24" cover. See other sections for trenching and backfill requirements.

H. Provide solid type chrome escutcheon plates at each exposed piping penetration of walls and ceilings and inside casework.

I. Provide shutoff valves at each branch from main. Provide shutoff valves for each fixture group to minimize interruption of service for maintenance and repair. Provide an exterior main shutoff valve and valve box as indicated on drawings. Provide area shut-off valves as necessary to facilitate testing and isolation of piping where tested and approved pipes are put into service.

J. Piping thru metal studs, structural members, etc. shall be isolated from metal to metal contact with plastic bushings specifically designed for the application.

3.03 TRAP PRIMER DRAINS (WHEN APPLICABLE)

A. Provide a complete system of drains as indicated on the floor plans from the primer assembly to the floor drain/hub drain connections.

B. Piping below slabs shall be installed in the gravel bedding below the concrete flooring and held as level as possible. Piping to be sleeved with an approved protective covering.

3.04 TESTING

A. Water piping systems shall be subjected to a hydrostatic test of 125psig or 1-1/2 times operating pressure whichever is greater.

B. All piping shall be tested before being insulated or concealed. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.

C. Provide test report showing all field tests performed to prove compliance with the specified criteria. The testing report shall be bound or submitted in PDF format. Report shall be submitted and approved prior to final payment. The report shall include the following:

1. Date of test.
2. Persons present.
3. System tested.
4. Test medium.
5. Pressure tested.
6. Lines tested and location.
7. Duration of test.
8. Pressure drop.

D. This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests inspections have been made and approvals obtained. This Contractor shall notify the Engineer four days prior to testing to allow for scheduling. If the Engineer is called for an observation and the Engineer finds the work not ready or the test failed, this Contractor shall reimburse the Engineer at the Engineer's standard hourly rate.

3.05 STERILIZATION OF DOMESTIC WATER PIPING SYSTEM

A. The entire system shall be flushed for a minimum of two hours and then drained prior to sterilizing by the following method or other methods satisfactory to the Engineer and the Authority Having Jurisdiction.

B. Fill piping system with a 50 ppm chlorine solution. Open and close all valves to thoroughly distribute solution thru all piping. Allow solution to stand for 24 hours then test for residual chlorine at the ends of the system. If less than 25 ppm is indicated, repeat the sterilization process. When tests show at least 25 ppm of residual chlorine, flush out the system until all traces of chlorine is removed. Open and close all valves in system several times during flushing period.

C. The Engineer reserves the right to test, or have, the water tested again at any time prior to final acceptance of the work. If found to be unsafe, the Contractor shall re-chlorinate the system until the water is proven equal to that supplied by the public system. It is the

responsibility of this Contractor to ensure the water is equal to that supplied by the public system.

D. Contractor shall arrange for laboratory testing for a bacteriological examination of potable water system at various locations. The samples shall be tested to meet requirement of the AHJ and shall not be of less quality than provided by the public system. Submit a copy from testing agency prior to submitting for final payment.

E. Minor work such as repairs or replacement of a single fitting or valve, shall be pre-cleaned and disinfected by immersion in solution of 300 ppm chlorine for 1 hour.

3.06 FINAL ACCEPTANCE

A. Before final acceptance, this Contractor shall furnish a certificate of inspection and final approval from the AHJ to the Owner and be in accordance with the latest revisions of the applicable Codes and the Approved Plumbing Drawings and Specifications. Contractor shall also furnish report of test, sterilization compliance and backflow device(s) certificates.

END OF SECTION

SECTION 22 13 10

SANITARY SEWER PIPING SYSTEM

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.

1.02 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment, administration and perform all operations required for the correct installation of all sanitary sewer piping systems indicated on Drawings and specified in this section.

B. Work Included: All sanitary sewer piping and equipment indicated throughout the building and extension of the sanitary sewer to the indicated termination point.

1.03 REFERENCES

A. All plumbing installation and fabrication shall be in accordance with applicable State and Local Plumbing Codes.

1.04 SUBMITTALS

A. Submit catalog data and Shop Drawings for all materials and equipment listed under this section. Include submittal data on related specifications as applicable.

B. Materials or equipment installed without review or after rejection shall be replaced with new by this contractor at no additional cost to other parties.

C. All materials and equipment shall be new and without defect unless specifically noted or specified otherwise.

D. The supplier certifies the materials and equipment to be satisfactory for the application involved.

E. The Contractor agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the Engineer, the Contract Documents shall supersede.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING SYSTEM

A. Buried, Exterior and Below Slab:
   1. Cast Iron Pipe: ASTM A-74 spun service weight.
      a. Fittings: Cast iron.
      b. Joints: Hub-and-spigot, compression type with ASTM C-564 neoprene gaskets.

2. PVC Pipe and Fittings: Schedule 40 per ASTM D-1785 / ASTM D-2665.
   a. Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.
3. Provide sleeves for all piping penetrations under or through footings, foundation walls, grade beams, floors above grade and walls. Sleeves for insulated piping above grade shall be sized for the insulation diameter. Annular space between the insulation and sleeve shall be sealed or fire caulked as detailed on the drawings. Sleeves shall be 2 pipe sizes larger than the service pipe. Coordinate with the Architectural and Structural drawings for locations.
4. This Contractor shall provide and install all cast iron pipe for all kitchen waste systems.

B. Above Slab, Interior:
1. Cast Iron Pipe: ASTM A-888 spun service weight. Cast iron fittings and joints shall be no hub. Couplings shall be CISPI Standard No. 310-95 with corrugated stainless steel shield and 4 stainless steel retaining bands with 5/16" worm gear hex head socket. Couplings shall be Husky HD 2000.
2. PVC Pipe and Fittings: Schedule 40 per ASTM D-1785 / ASTM D-2466.
   a. Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.
3. This Contractor shall provide and install all cast iron pipe at all fire rated assemblies, continuous floor to floor through assemblies. This Contractor shall provided and install cast iron pipe in return air plenums and where indicated on the Drawings. This Contractor shall coordinate with Contract Documents for compliance. This Contractor shall provide and install all cast iron pipe for all kitchen waste systems.

2.02 SANITARY SEWER SPECIALTIES

A. Cleanouts: Cleanouts shall be the same nominal size as the pipe served up to 4" and not less than 4" for line sizes greater than 4".

2.03 SANITARY SEWER SYSTEM INSULATION

A. All sanitary piping exposed in or installed over unheated spaces shall be insulated. Exposed floor drain bodies and P-traps shall be insulated.

PART 3 EXECUTION

3.01 GENERAL

A. Installation dimensions between partitions or walls shall be acquired from the Architectural Drawings. Work shall be roughed-in so that all exposed piping will be straight and true without bends or off-sets.

3.02 SANITARY SEWER PIPING SYSTEM

A. Provide a complete system of sanitary sewer drain, waste and vent piping including interior and exterior work as indicated.

B. Piping up to 2-1/2" shall be sloped at least 1/4" inch per foot. Piping 3”, 4" and 6" shall be sloped at least 1/8 inch per foot. Piping 8" and larger shall be sloped at least 1/16 inch per foot.

C. Provide cleanouts as required by Code and as indicated on the Drawings. Provide two way exterior cleanouts within 5 feet of the building. Interior cleanouts in floors shall be flush with finished floors. Interior cleanouts in walls shall be above the flood level of plumbing fixtures. Exterior cleanouts in unpaved areas and areas paved with other than concrete shall be set in

concrete pads flush with finished grade as detailed on the drawings. All Clean Outs are to be the same size as the pipe they serve.

D. Vents through roof shall be a minimum of 3 inches in diameter and shall terminate at least 12 inches above the roof. This Contractor shall review all Drawings and ensure vent termination is a minimum of 10 feet from any door, window or outside air inlet.

E. Drainage piping shall be installed with hubs upstream of each pipe section. Provide reducing fittings where different sizes of pipe are to be connected. Bushings shall not be used. Provide longsweep fittings, sanitary tees and combination wyes with 1/8 bends as applicable.

F. Escutcheons shall be provided on exposed wall penetrations. Escutcheons shall completely cover the piping, insulation and penetration. Escutcheon shall be single piece construction with chrome finish.

G. Interior wall cleanouts shall have stainless steel wall covers sized for the cleanout and covering the wall opening. Cleanout covers shall be installed flush with the wall.

H. Back to back water closets shall be installed with double combination wye with 1/8- bend. Double sanitary tees and double fixture fitting will not be allowed.

3.03 TESTING

A. All piping shall be tested before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.

B. All waste and vent piping shall be subjected to a hydrostatic test of not less than a 10-foot head. Piping shall be tested for not less than 4 hours, prior to installing fixtures. Underground piping shall be tested before backfilling.

C. All vent piping shall be smoke tested.

3.04 CLEANING

A. At completion of all work, fixtures, exposed materials and equipment shall be thoroughly cleaned.

3.05 FINAL ACCEPTANCE

A. Before final acceptance, the Plumbing Contractor shall furnish a certificate of inspection and final approval from the AHJ to the Owner and be in accordance with the latest revisions of the applicable codes and the approved Plumbing Drawings and Specifications. Contractor shall also furnish a report of test and backflow device certificates.

B. Provide test report showing all field tests performed to prove compliance with the specified criteria. The testing report shall be bound or submitted in PDF format. Report shall be submitted and approved prior to final payment. The report shall include the following:
1. Date of test.
2. Persons present.
3. System tested.
4. Test medium.
5. Pressure tested.
6. Lines tested and location.

7. Duration of test.
8. Pressure drop.

C. This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests inspections have been made and approvals obtained. This Contractor shall notify the Engineer four days prior to testing to allow for scheduling. If the Engineer is called for an observation and the Engineer finds the work not ready or the test failed, this Contractor shall reimburse the Engineer at the Engineer's standard hourly rate.

END OF SECTION

SECTION 22 42 10

PLUMBING FIXTURES

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.

1.02 DESCRIPTION OF WORK

A. Provide all fixtures, labor, materials, equipment, administration, balancing and services required for complete installation of all plumbing fixtures indicated on Drawings and specified within this section.

1.03 REFERENCES

A. All plumbing installation and fabrication shall be in accordance with applicable State and Local Plumbing Codes and project funding requirements.

1.04 SUBMITTALS

A. Submit catalog data and shop drawings for all materials and equipment listed under this section.

B. Materials, fixtures, or equipment installed without review or after rejection shall be replaced by this Contractor with Basis of Design items.

C. All materials, equipment, and appliances shall be new, without defect, first line quality unless specifically noted or specified otherwise.

D. The supplier, by submitting, certifies the materials and equipment to be satisfactory for the application involved.

E. Contractor further agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the Engineer, the design drawings and specifications shall supersede.

PART 2 PRODUCTS

2.01 PLUMBING FIXTURES – GENERAL

A. Provide all plumbing fixtures complete with trim required, and connect in a manner conforming to the Local, State and International Building Codes. Certain fixtures may be furnished by others under other sections of these Specifications. Provide rough-in and final connections including all valves, traps, specialties, etc. required.

B. Provide traps for all waste connections where not furnished with the equipment and stop cocks or valved shut-offs for all water connections to all sinks and other items of equipment. All exposed pipe and metal, including that within cabinets, shall be chrome plated cast brass

with the same gauge thickness as the specified trap. Stainless steel bell escutcheons shall be installed covering the hub connections below sinks and lavatories and extend to the wall or back of cabinet for a tight fit.

C. Quality and Type of Fixtures:
1. Plumbing fixtures, carriers, etc. are specified by manufacture and model numbers for the purpose of establishing type and quality. Equals must be pre approved by the Engineer. Pre approval submittals must be received by this office no later than 10 working days before the job bids.

2.02 FIXTURE SCHEDULE

A. P-1 Water Closet (ADA Accessible): Sloan model ST-2029 ADA water closet, 1.6 gal/flush, 17” high, white, floor mounted elongated siphon jet, 2-1/8” fully glazed trap-way, bolts & caps, with Royal 111 SFSM-1.6 flush valve, battery powered, chrome finish flush valve with solid ring pipe support. Install with Bemis model 1955SSCT solid plastic open front seat with stainless steel self-sustaining check hinge and Sta-Tite fastening system. Toilet flange shall be stainless steel. Plastic toilet flanges will not be accepted. Maximum seat height shall be 17-19” A.F.F. Water closet and flush valve shall be by the same manufacturer. Verify grab bar elevations with Architectural elevations prior to flush valve rough in.

B. P-2 Lavatory (ADA Accessible): Vitreous China Wall-Hung Lavatory American Standard Decorum 9024.004EC - 13 15/16"x12 13/16"x5" (20"x18" overall). Delta 520LF-HDF all brass faucet. Install Zurn Z1231 concealed arm carrier. Install McGuire No. 155WC offset grid drain, 17-gauge cast brass chrome plated trap with cleanout & Zurn Z-8804-XL-LR-LK supplies with stops. Insulate the water and waste pipes below the lavatory with Truebro Lav Guard 2 series molded paintable vinyl covering, white finish with reusable snap clip fasteners. Provide Powers LFLM495 series, point of use mixing valve with a maximum discharge temperature of 105°F to 109°F. See Architectural interior elevations for fixture height prior to rough-in

C. P-3 Mop Sink: Fiat model TSB3000 24”x 24” x 12” deep pre-cast terrazzo sink, with stainless steel caps on drop front, 3” deep seal trap, stainless steel strainer, quick drain connector, stainless steel wall guards, three-mop hanger and 30” long flexible hose with hose mounting bracket. Seal the sink to the wall and floor with silicone sealant prior to installing the stainless steel wall guards. Install T&S Brass B-0665-CRBSTPVR with body mounted vacuum break, garden hose end, 3” lever handles and wall support bracket. Mount the mixing faucet 42” above the floor. Mount the mop hanger 5’ above the floor on the opposite wall of the faucet or as shown on Architectural Drawings. Provide Powers LFLM495 series point of use mixing valve with a maximum discharge temperature of 120°F.

D. P-4 Two Compartment Scullery Sink: Elkay SS82302. 33”x27-1/2”x14”, 14 gauge 304 series stainless steel, welded construction, 8” backsplash, 2” edge rim, 3-1/2” drains, 1-5/8” legs with 1” adjustable feet. Provide and install Elkay model LK945-GN08-T4-T swing spout faucet, two Elkay model LK-25-RT roto handle stainless steel strainers, two 17-gauge cast brass chrome plated trap with cleanout, Zurn Z8805-XL-LRLK-PC supplies with stops. Provide Powers LFLM495 series point of use mixing valve with a maximum discharge temperature of 120°F, or as directed by the Owner. Mount TMV valve to wall. TMV valve shall not be installed loose.

E. P-5 Electric Water Cooler (ADA Accessible Dual Unit with Bottle Filling Station): Elkay model LZSTL8WSSK, wall mounted, dual unit, 120 volt, 370 watts, 8 gallons per hour cold water, with filtration system and bottle filling station, stainless steel basin and shrouds. Install with Zurn model Z1225-BL dual plate carrier, 17 gauge cast brass chrome plated trap and Zurn Z-8804-XL-LR-LK supplies with stops. Unit mounting height shall be as selected by the Architect. See interior elevations. Anchor the cooler firmly to the carrier plates on top and

bottom. Refrigeration system shall have a 5-year warranty. Four (4) additional replacement filters shall be furnished with the cooler.

F. P-6 Emergency Shower/Eye Wash Station: Acorn S2340 pedestal mounted combination station with an eye/face wash. Eye / face wash shall have a stainless steel bowl, a stay open 1/2" ball valve with a push handle. Shower shall have a stainless steel showerhead, a stay open 1" ball valve with pull rod. Provide ASSE 1071 thermostaic mixing valve. TMV to be installed in the wall to the side of the shower assembly.

G. P-7 Floor Drain: Zurn model ZN-415BZ-7B, two-piece cast iron threaded fully adjustable drain body with flashing collar. Install with type "B" 7" diameter polished nickel bronze, heel proof strainer, trap primer connection and deep seal trap. Floor drain shall be furnished with a Trap Guard insert. Contractor shall remove the strainer and provide a sheet metal construction cover during construction and reinstall strainer just before final observations.

H. P-8 Recessed Floor Drain: Zurn model ZN-415-7I, two-piece cast iron threaded fully adjustable drain body with flashing collar. Install with type "I" 7" diameter polished nickel bronze, heel proof strainer with raised flange, deep seal trap and trap primer connection. Floor drain shall be furnished with a Trap Guard insert. See Drawings for line size. See detail for installation requirements. Contractor shall remove the strainer and provide Zurn Z499B, sheet metal construction cover during construction and reinstall strainer just before final observations.

I. P-9 Electric Water Heater: AO Smith Commercial Electric Water Heater model DRE-120 15, storage capacity of 119 gallon, 15 kW input (3 – 5kW elements), 480/3, seamless glass-lined steel tank construction, foam insulated, operating and safety controls, vacuum breaker and AGA/ASME T&P relief valve. Tank shall have a 3 year warranty. Provide an Amtrol Therm-X-Trol ST-30 expansion tank. Drain piping from the T&P relief and drain pan shall be Type L copper

J. P-10 Oil / Grit Separator: Striem Products model OS-50. Provide traffic rated extension collar, ring and gasketed cover. Cover shall bolt down to ring compliant with Sadie Grace Andrews Act Alabama Code. Provide anti-buoyancy slab. Provide concrete slab covering the perimeter of the tank. Install per manufacturer's requirements.

K. P-11 Exterior Wall Hydrant: Zurn Z1320-CXL-CL-NB-WC, lead free, anti-siphon, non-freeze, automatic draining with vacuum breaker, integral backflow preventer, wall clamp assembly, polished nickel bronze finish and furnished with loose key operator. Install tight to wall and caulk weather tight. Coordinate operating rod depth with wall thickness and building insulation location. Coordinate hydrant termination with finished grade. Hydrant shall be no more than 24" above finished grade. Hydrant piping may have to be installed below the slab. If piping is installed below slab, the piping shall be encased in a 2" sleeve.

L. CO Cleanout: Provide threaded brass cap and stainless steel cover plate. Plate shall bolt into brass cap.

M. WCO Cleanout: Provide threaded brass cap and stainless steel cover plate. Plate shall bolt into brass cap.

N. ECO Exterior Cleanout: Zurn model Z1400-K-BP-DC, coated cast iron adjustable body with anchor flange, ductile heavy-duty scoriated secured cleanout cover and internal bronze plug. Install to the listed waste pipe with a Huskey SD4000 coupling with stainless steel connector bands.

O. PRV Pressure Reducing Valve: Pressure Reducing Valves (PRV): All plumbing systems shall be equipped with a pressure reducing valve at the building's water service entry. PRV shall be equal to Zurn model ZW209BP, Lead Free compliant with Low Flow bypass and control for 1 gpm continuous minimum flow. PRV to be sized to have not more than 5 psi through the valve at maximum continuous flow. PRV shall be line size unless otherwise noted. Provide full port ball valve, union and strainer at inlet of PRV and union and full port ball valve at outlet of PRV.

PART 3 EXECUTION

3.01 GENERAL

A. Obtain exact centerline rough-in dimensions between partitions or walls from the Architectural Drawings. Work shall be roughed-in so that all exposed piping will be straight and true without bends or off-sets. Water supplies shall connect through walls with stops and chrome plated escutcheons with setscrews. Where fixtures are without supporting legs or carriers secure wall hangers to bolts welded to 3/16" steel plates, mounted against walls within chases.

B. Where backs of fixtures join wainscoting or tile, the tile shall be ground flat and the joints made close. Apply a smooth bead of paintable white caulking compound around back of fixture at outside edge before final setting. When fixture is set, wipe compound so that joint is sealed smooth.

C. Mount fixtures to the heights above finished floor as indicated on the Architectural drawings.

3.02 CLEANING

A. At completion of all work, fixtures, exposed materials and equipment shall be thoroughly cleaned and all temporary stickers, markings, etc. shall be removed.

B. All strainer screens shall be removed and cleaned. All floor drain strainer screens grid pattern shall match that of the floor covering grid pattern. All lavatory and sink strainers shall align with the geometry of the fixture. This Contractor shall coordinate rough-in work with necessary Trades for compliance.

END OF SECTION

SECTION 23 05 00

MECHANICAL GENERAL PROVISIONS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, management, equipment, fixtures, start-up, fabrication, services, cleaning, testing and balancing required for complete installation of all provisions indicated on Drawings, Schedules and specified herein.

B. This Contractor shall review all of the Contract Documents including all Drawings and Specifications of all Trades to ensure the complete implementation of Work.

C. Where shown or noted on the Drawings or where called for in other Sections of the Contract Documents, the Contractor for this Division shall install equipment furnished by Others, and shall make required service connections. Contractor shall verify with the supplier of the equipment the requirements for the installation.

D. Where the words "provide," "furnish," "include," or "install" are used in the Specification or on the Drawings, shall mean to furnish, install, and test complete and ready for operation, the items mentioned.

E. Drawings for the Work are diagrammatic, to express the scope of the Work and to indicate the general arrangement and locations of the Work. Due to Drawings constraints, certain items such as pipe fittings, offsets, access panels, devices and sleeves may not be shown. This Contractor shall be responsible for confirming that the devices, piping and equipment fit the space provided. The location and sizes for pipe, fittings, sleeves, access panels and other basic items required by Code and other sections shall be coordinated and included for the proper installation of the work.

F. Specifications may not deal with diminutive installation requirements, parts, controls, and devices required which may be required to produce the equipment performance specified or as required to meet the equipment warranties and applicable Code. Such items shall be included, whether or not specifically called for in the Contract Documents.

G. Coordinate with all Trades in submittal of shop drawings. Shop drawings shall be prepared to clearly indicate all applicable components. Space conditions shall be detailed to the satisfaction of all trades, subject to review and final acceptance by the Engineer. In the event that the Contractor installs work before coordinating with other trades or so as to cause any interference with work of other Trades, the necessary changes shall be made to the work to correct, at no additional cost to the Owner, Architect or Engineer.

1.03 SEISMIC RESTRAINT / PROTECTION

A. All Life Safety Rated Systems shall be seismically restrained and protected including sway bracing, flexible couplings, anchoring, etc. Unless otherwise noted on the Drawings, Specifications and or general Contract Documents, the Seismic Site Class shall be "D" and Design Category shall be "C." The seismic design shall be by a competent Professional Engineer licensed in the Project's State. The Professional Engineer responsible for the seismic design shall have no less than 5 years experience in the design of seismic protection systems. The Contractor installing the seismic protection shall have no less than 5 years experience in the installation of seismic protection systems shall meet the Contractor's Qualifications herein. Seismic designer shall coordinate with Architectural Life Safety Drawings and Structural Engineer / Drawings, prior to bid, and determine the required extent of Seismic restraint / protection.

1.04 CONTRACTORS QUALIFICATIONS

A. The qualifications of this Contractor shall be as follows:
1. Contractor must be a licensed contractor, specific to this section's Trade, in the project's State.
2. The Contractor shall have been in the mechanical contracting business for the last five consecutive years, under their current corporation name with more than 75% of the same corporate officers.
3. The Contractor shall have completed at least two projects of comparable size and scope within the past two years without receipt of a Notice to Cure.
4. If Contractor has received a Notice to Cure on any project, that Contractor is excluded from performing work on this project.
5. Contractor to have a minimum of 10 qualified field employees that are full time employees of the Contractor’s Company and have been with the Contractor’s Company full time (8 hours a day for 40 hours per week) for a minimum of 2 years. Work performed under the Contractor’s Scope of Work must be performed by full time employees of the Contractor and cannot be subbed out to a 3rd Party Workforce other than those specified to be performed by a 3rd Party e.g. Insulation, Controls, Test & Balance, and Water Treatment.
6. The Contractor's main construction and service office shall be located within 150 driving miles distance of the project site unless approval, 10 days prior to project bid date, has been issued in writing by the Owner, Architect and Engineer.
7. The Contractor shall provide substantiating proof of these requirements 10 days prior to project bid date. If substantiating proof is not submitted and approved, the Contractor will not be allowed to bid or work the project.
8. The General Contractor shall not purchase this Contractor's equipment, materials, etc. All materials, equipment, labor, etc. required to perform the Work herein shall be at the cost of this Contractor.

1.05 CODES AND STANDARDS

A. Conform to latest edition of governing codes, ordinances, and or regulations of city, county, state, utility provider, and or authority having jurisdiction. Where local codes are not applicable, conform to the latest International Code Counsel requirements.

B. Adopted ICC and ASCE 7 where seismic restraint / protection is required.

1.06 FEES, PERMITS, AND INSPECTIONS

A. Secure all permits and pay all fees required in connection with the Work.

B. Coordinate and provide such inspections as are required by the Authorities having jurisdiction over the site.

C. Where applications are required for procuring of services to the building, prepare and file such application with the Utility Company. Furnish all information required in connection with the application in the form required by the Utility Company.

1.07 ACTIVE SERVICE

A. Existing active services; water, gas, sewer, electric, are to be located and shall be protected against damage. Do not prevent or disturb operation of active services which are to remain. If active services are encountered which require relocation, make request to authorities having jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the Utility, Municipality or Authority having jurisdiction.

1.08 SITE INSPECTION

A. Contractor shall inspect the site to become familiar with conditions of the site which will affect this Contractor's work and shall verify points of connection with utilities, routing of Work to include required clearances from any obstacles.

B. Additional payment will not be provided for changes in the Work required because of Contractor's failure of said familiarization and understanding.

1.09 OPENINGS, CUTTING, AND PATCHING

A. This Contractor shall coordinate required openings in the structure, walls, ceiling, floor roof, etc. with all Trades and applicable Engineers.

B. When additional patching is required due to failure of coordination; provide the patching required to properly close openings including "put back" and painting. Patching must meet the Owner's, Architect's and all applicable Engineer's approval.

C. When cutting and patching of the building is required due to failure to install piping, sleeves, or equipment on schedule or failure to provide the information required for openings, provide the cutting and patching as required. Patching must meet the Owner's, Architect's and Engineer's approval.

1.10 PROTECTION

A. The permanent HVAC equipment for the use of the building’s function and occupancy is not to be started up for conditioning the building for construction purposes and shall not be operational without the approval of the Architect, Engineer and Owner until all exterior doors, glazing and roofing is completed, the building is sealed, secured and dried in without water infiltration from the roof, walls or floor, sheet rock and other wall or non-lay in ceiling types are installed, final sanding of sheet rock and other wall or non-lay in ceiling types has been completed, all floor grinding and sanding has been completed and the outside air intakes are closed and plastic installed over all outside air intakes along the building’s exterior / roof.

B. Equipment and material shall be completely protected from weather elements, painting, plaster, etc. until the project is completed. Damage from rust, paint, scratches, etc. shall be repaired as required to restore equipment to original condition. If repair is deemed

unacceptable by the Owner, Architect or Engineer, the equipment, material, device, etc. shall be replaced with new at no additional cost to the Owner, Architect or Engineer.

C. Piping within walls, in particular within studs, shall be protected with 16 gauge metal cover plate, on both sides of stud, equal to Sampson HSS Stud Shoe.

D. Where the installation or connection of equipment requires work in areas previously finished by other Contractors, the area shall be protected and not marred, soiled, or otherwise damaged during the course of such work. Contractor shall arrange with all other Contractors for repairing and refinishing of such areas which may be damaged.

E. When welding is required inside the building, a fire watch shall be provided. The fire watch shall provide adequate protection of existing surfaces and observance of adjacent floors where penetrations exist or are to be made.

1.11 WIRING FOR EQUIPMENT

A. Electrical work provided under Division 23 shall conform to the requirements of Division 26.

B. Division 26 shall provide power for motors and equipment furnished by this Contractor including safety disconnect switches, starters and final connections. This Contractor is responsible for coordinating with the Electrical Contractor and all other Trades, for wiring that is beyond this Contractor's credentials.

C. Division 23 shall provide all motors, controllers and contactors for equipment furnished under this Division, except where they are to be provided under another Division.

D. Include provisions required for integration into building Life Safety and Building Automation Systems.

E. Coordinate with Division 26 for all equipment which requires electrical services. Provide information as to the exact location for rough-in, electrical load, size, and electrical characteristics for all services required.

F. Where motors or equipment furnished require larger services or services of different electrical characteristics than those called for on the Electrical Drawings, this Contractor shall coordinate with the Electrical Contractor and the Electrical Engineer to provide a larger service as required, the cost of which shall be the responsibility of this Contractor.

1.12 SUBSTITUTIONS

A. Any equipment, material, etc. submitted as "equal" to the basis of design shall be accompanied with a "one – to – one" comparison letter from the vender stating any differences from the equipment being submitted and the basis of design. A letter is also to be submitted from the vender, on the vender's letterhead, stating that the vender has received a copy of the job all Specifications, Addendums and Drawings.

B. Substitutions for the scheduled and specified equipment shall only be done with the prior approval of the Engineer, and shall be obtained in writing. Prior approvals shall be obtained no less than 10 days prior to the project bid date. Prior approval shall not relieve the contractor of supplying equipment that meets the specifications, capacities, efficiencies, physical dimensions, etc.

1.13 SUBMITTALS

A. General:
   1. Submit to Engineer shop drawings and product data required by the Drawings and Specifications.
   2. Contractor shall compile all data required to satisfy the Scope of Work implied by the Contract Documents.
   3. Submit a minimum of 6 copies of data, more if required by the Architect. Coordinate with Architect and Engineer to verify if Electronic Submittals, i.e. PDF, will be allowed or required prior to bidding the project. If Electronic Submittals are allowed, 2 bound hard copies must be submitted as well as the Electronic file.

B. Submittal Requirements:
   1. Review shop drawings and product data prior to submission to Engineer.
   2. Submit only complete project submittals. Partial submittals or submittals not complying with the above requirements shall be returned to the contractor un-marked and rejected.
   3. Engineer's review is only to check for general conformance with the design concept of the project and general compliance with Contract Documents. No responsibility is assumed by the Engineer for correctness of dimensions, details, quantities, procedures, etc. shown on shop drawings or submittals.
   4. In the interest of project expediency the contractor may pre-submit long lead items for pre-approval pending prior approval of the Engineer. However, the Contractor shall not be relieved of including the same data as required by submittal binder and shall be included therein.
   5. The Contractor may turn in submittals without control drawings if they require a longer production time. All other items shall be included.
   6. If a pre-submittal is made, provide a tab for items not included and include an explanation of why item is not included in the submittal and the expected submittal date.
   7. PDF submittals must be searchable and tabbed per section. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
   8. Hard copy submittals shall be compiled in a 3-ring, hard bound, loose leaf binder. The face of the binder shall be clearly marked with the project title and number, the name of the Owner, Architect, Engineer, General Contractor and this Contractor.
   9. Provide an index, numerically indicating all sections applicable to the submittal.
   10. Separate binders shall be provided for HVAC, Plumbing and Fire Suppression trades.
   11. Provide tab dividers for each section submitted.
   12. If an item appears on the drawings not specifically covered by the specifications, provide an additional numeric tab at the end of the index detailing the item and include the submittal data in the binder. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
   13. All equipment included on the submittal sheets shall be marked to indicate the mark of the equipment as shown on the drawings. The equipment shall be high-lighted to clarify which items are being submitted.
   14. When required, the contractor will be provided with an electronic copy of this section's Drawings. Shop drawing submittals shall consist of one digital copy in .dwg format and one in PDF format. The drawing's sheet sizes shall be formatted to the same size as the Contract Documents. A digital copy in PDF format shall be returned to the contractor with the Engineer's approval stamp and comments.
   15. Verify field measurements, field construction criteria, catalog numbers, and similar data.
   16. Notify Engineer in writing of deviations from requirements of Contract Documents at time submittals are made. A "deviation" shall be construed to mean a minor change to the sequence indicated on drawings or specification. A "deviation" is not intended to allow substitutions or product options.

17. Deviations in submittals from requirements of the Contract Documents are not relieved by Engineer's review of submittals, unless Engineer gives written acceptance of specific deviations.
18. Work may not commence until submittals have been returned with Engineer's stamp and signature indicating approval. Materials and equipment that were installed prior to being approved shall be removed and replaced with approved items at no additional cost to other parties.
19. Shop Drawings and or submittals requiring resubmission to the Engineer due to non-compliance with the Contract Documents and or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Engineer for review. The Contractor shall ensure the completeness and compliance of the submittal materials and shall reimburse the Engineer at the Engineer's standard hourly billing rate for review of submittals beyond the second submission.
20. Omission in shop drawings of any materials indicated in Contract Drawings, mentioned in Specifications, Scheduled or required for proper execution and completion of Work, does not relieve the Contractor from responsibility for providing such materials.

1.14 OPERATING AND MAINTENANCE MANUALS

A. General:
   1. Provide three "As Built" copies of shop drawings, product data, and other information described in this Section for use in compiling operating and maintenance manuals.
   2. Provide legible submittals made by permanent reproduction copy equipment from typewritten or typeset originals.
   3. Pre-punch 8-1/2 inch x 11 inch sheets in three ring, hardback, binders.
   4. Submit larger sheets in rolled, protected packages.
   5. Submit all in a PDF format as well as the hard copy sets mentioned above.

B. Compilation:
   1. The Contractor will receive shop drawings, brochures, materials lists, technical data, warranties, guarantees, and other pertinent information and will assemble, catalog, and file information in loose-leaf, hardback three-ring binders.
   2. Submittal Format: Provide each of the following items, as applicable, for each required item or system. Refer to specific Specification section requirements.
      a) Item: Use appropriate Section title.
      b) System Description: Provide a detailed description of each system, describing function, components, capacities, controls and other data specified, and including the following:
         (1) Quantity.
         (2) Sizes.
         (3) Type of operation.
         (4) Detailed operating instructions, including start-up and shut-down of each system, with indications for position of all controls, as applicable.
         (5) Wiring Diagrams: Complete wiring diagrams for internally wired components including controls.
         (6) Operating Sequence: Describe in detail.
         (7) Manufacturers Data: Provide catalog data sheets, specifications, nameplate data and parts list.
         (8) Preventative Maintenance: Provide manufacturer's detailed maintenance recommendations.
         (9) Troubleshooting: Provide manufacturer's sequence for trouble-shooting procedures for operational problems.
         (10) Extra Parts: Provide a listing of extra stock parts furnished as part of the Contract.

(11) Warranties: Provide specific manufacturer's warranty. List each component and control covered, with day and date warranty begins, date of expiration and name, address and telephone number of person to contact regarding problems during warranty period.
(12) Directory: Provide names, addresses, emails and telephone numbers of Contractor, its subcontractors, suppliers, installers and authorized service and parts suppliers.

1.15 RECORD DRAWINGS

A. Detailed Requirements for Record Drawings:
1. During the progress of the work, the General Contractor shall require the job superintendent for the plumbing, air conditioning, heating, ventilating, and fire protection subcontractors to record on their field sets of drawings the exact locations, as installed, of all conduits, pipes, and ducts whether concealed or exposed which were not installed exactly as shown on the contract drawings.
2. Upon completion of the work, this data shall be recorded to scale, by a competent CAD operator in .dwg format of no more than two versions past current. Electronic drawings in .dwg format will be furnished to the Contractor by the Architect/Engineer. Where the work was installed exactly as shown on the contract drawings the .dwg file shall not be disturbed other than being marked "As-Built." In showing the changes, the same legend shall be used to identify piping, etc., as was used on the contract drawings. Separate electronic drawings shall be prepared for plumbing, heating, air conditioning, and ventilating work unless two or more divisions are shown on the same sheets of the contract drawings, in which case the various subcontractors shall also show their changes on the same sheets. Each sheet shall bear the date and name of the Contractor submitting the drawings.
3. The Contractor shall review the completed As-Built drawings and ascertain that all data furnished on the .dwg files is accurate and truly represent the work as actually installed. Where plumbing, hot or chilled water pipes, inverts etc., are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced by using the original bench mark used for the institution or for this project.
4. The Engineer shall authorize the Contractor to produce and distribute the As-Built drawings as follows:

a) One (1) to the Engineer.
b) One (1) to the Architect.
c) One (1) to the Owner.

1.16 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Products specified only by reference standard, select product meeting that standard in accordance to the projects funding requirements, i.e. Made in the USA.

B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with the schedules and / or specifications pending prior approval.

C. For products specified, noted or scheduled stating "or equivalent," "or equal" or similar wording, submit a request for proposed substitutions for any product or manufacturer which is not specifically named for review and approval by the Engineer.

D. For products specified by naming only one manufacturer product, the Engineer may approve a product of equal or greater quality or performance. Submittal must be received 10 days prior to project bid date accompanied with a one – to – one comparison letter.

1.17 SUBSTITUTION SUBMISSIONS

A. Each substitution submittal request shall be accompanied with:
   1. Comprehensive data proving compliance of proposed substitution with requirements stated in the contract documents:
      a) Product identification.
      b) Manufacturer's literature shall identify:
         (1) Manufacturer's name and supporting address, phone number, point of contact and email address.
         (2) Product description.
         (3) Reference standards.
         (4) Performance and test data.
         (5) Warranty information of all components.
      c) Two projects of similar size and scope on which product has been used, and date of each installation.
      d) Itemized comparison of the proposed substitution with product specified listing any variations.
      e) Changes in construction schedule.
      f) Any effect of substitution on other contracts.
      g) List of changes required in any other work, products or required to be made by other Trades.
      h) Designation of availability of maintenance services, sources of replacement materials.

B. Substitutions will not be considered for acceptance when:
   1. Substitution will require substantial revision of contract documents.
   2. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor or Supplier prior to bid.
   3. Information is deemed inadequate by the Engineer necessary for complete evaluation.

1.18 CONTRACTOR'S SUBSTITUTION RESPONSIBILITIES

A. Contractor affirms that:
   1. Contractor has determined that the substitution is equivalent to or superior in all respects to that specified.
   2. Contractor will provide the same warranties and or bonds for substitution as for product specified.
   3. Contractor will coordinate installation of accepted substitution into the work, and will make such changes as required for the work to be complete in all respects.
   4. Contractor waives claims for additional costs caused by substitution which may subsequently become apparent.

B. The Contractor shall have included all costs associated with the substitution for the specified products or materials, and that no additional cost will be incurred by any other party in order to fully incorporate the substituted item(s).

C. The Contractor agrees to reimburse the Architect/Engineer for any architectural or engineering re-design that is required by the substitution to be fully incorporated. The reimbursement shall be at the Architect/Engineer's standard billing rate.

1.19 ENGINEER'S DUTIES

A. Review Contractor's requests for substitutions with reasonable promptness.

B. Notify Contractor in writing of decision to accept or reject requested substitution.

1.20 OBSERVATIONS OF WORK

A. The Contractor shall schedule an observation, performed by the Engineer and AHJ, one week in advance of the observation, prior to any Work being concealed, covered, etc.

B. If the Contractor schedules an observation and the Work is found not ready by the Engineer, the Contractor shall reimburse the Engineer, at the Engineer's standard hourly rate, including travel time, for a re-observation.

C. A copy of the AHJ's report for any work observed or inspected by the AHJ shall be submitted to the Architect and Engineer.

1.21 FINISHING

A. General: Prior to acceptance of the installation and final payment of the Contract, the Contractor shall perform the work outlined in the Contract Documents.

B. Cleaning: At the conclusion of the construction, all portions of the project work shall be cleaned thoroughly of all debris and unused materials remaining from construction.

C. Equipment, piping and duct systems shall be cleaned internally. The Contractor shall open all dirt legs and remove strainers / filters, completely blowing down as required and clean strainer screens of all accumulated debris. Finished strainers, sized by the manufacturer shall be installed in place of startup strainers, filters, etc.

D. All tanks, fixtures, and pumps shall be drained and proven free of sludge and accumulated matter.

E. All temporary labels, stickers, etc., shall be removed from all fixtures and equipment. (Do not remove permanent name plates, equipment model numbers, ratings, etc.). Painting over equipment nameplates will not be allowed. Nameplates will be replaced with new if damaged or painted over. All equipment shall have affixed adjacent to the permanent nameplate, the unit identification on an engraved label with permanent adhesive or pop-rivet(s).

F. Plumbing fixtures, equipment, tanks, pumps, etc., shall be thoroughly cleaned externally as well.

1.22 TEST AND DEMONSTRATIONS

A. Systems shall be tested and placed in proper working order prior to demonstrating systems to Owner.

B. Prior to acceptance of the mechanical installation, demonstrate to the Owner or designated representatives all essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems. The contract shall allow for five working days and all required tools, devices, etc. to perform the demonstrations / instructions.

C. Provide necessary trained personnel to perform the demonstrations and instructions. Provide manufacturer's representatives for systems as required to assist with the demonstrations.

D. Dates and times for performing the demonstrations shall be coordinated with the Owner.

E. Upon completion of demonstrations, provide a certificate testifying that demonstrations have been completed. Certificate shall list each system demonstrated, dates demonstrations were performed, names of parties in attendance, and shall bear signatures of the Contractor and Owner.

1.23 PAINTING AND IDENTIFICATION

A. Touch-up paint where equipment has sustained "minor" damage shall be applied with factory provided paint and finish, to match original finish. Damaged shall only be deemed "minor" by the Engineer's assessment.

B. Provide engraved, laminated plastic tags for all equipment. Tags shall be attached with permanent adhesive or pop-rivet(s).

1.24 EXCAVATING, TRENCHING, AND BACKFILLING

A. Provide excavation necessary for underground piping, etc. Backfill trenches and excavations after work has been installed, tested and approved. Care shall be taken in excavating, that walls and footings and adjacent load bearing soils are not disturbed, except where lines must cross under a wall footing. Where a line must pass under footing, the crossing shall be made by the smallest possible trench to accommodate the pipe. Excavation shall be kept free form water by pumping if necessary. Any open trench shall be protected with signage, fencing, etc. Trenches shall be excavated in accordance with all regulatory Codes and AHJ requirements.

B. Trenches for piping and utilities located inside foundation walls and five (5) feet outside of the exterior wall shall be not less than sixteen (16) inches or more than twenty-four (24) inches wider than the outside diameter of the pipe to be laid. The widths of trenches for piping and utilities located more than five (5) feet outside of building foundation walls, other than for sewers, shall be governed by conditions found at the site.

C. Bottoms of trenches shall be so shaped that when pipe is in place the lower fourth of the circumference for the full length of the pipe will be supported on compacted fill. Fitting holes shall be dug so that no part of the weight of the pipe is supported by the fitting but shall be no larger than necessary for proper jointing. All sewers and piping required for the structure shall be excavated to at least (6) inches below pipe invert.

D. Immediately after testing and/or inspection, the trench shall be carefully backfilled with earth free from clods, brick, etc., to a depth one-half the pipe diameter and then firmly tamped in such a manner as not to disturb the alignment or joints of the pipe. Thereafter, the backfill shall be tamped every vertical foot.

1.25 CONCRETE WORK

A. Provide concrete bases and housekeeping pads for mechanical equipment unless indicated otherwise. Concrete work shall be as specified in the applicable Civil/Site and Structural Sections. Vibration pads, equipment bases, pipe supports and thrust blocks shall be provided by this Contractor.

B. Provide equipment anchor bolts and coordinate their proper installation and accurate location.

1.26 ACCESS PANELS

A. Access Panel shall be of appropriate size to allow for full service and removal of device behind the access panel.

B. Provide access panels where required and not shown on the drawings for installation by the drywall or masonry Contractor. Access panels shall be steel, primed ready for paint. All access panel locations shall be approved by the Architect/Engineer.

C. Provide fire rated access panels in rated walls, ceilings and floors. Rates shall be in compliance to the assemblies rating. This Contractor shall review Life Safety Drawings for required locations of fire rated access panels.

1.27 SLEEVES

A. Sleeves passing through non-load bearing or non-fire rated walls and partitions shall be Schedule 40 PVC pipe or cast iron pipe.

B. Sleeves passing through load bearing walls, concrete beams, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected.

C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.

D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions, and ceilings, and shall extend 1/2" above finished floors. Extend sleeves 1" above finished floors in areas likely to entrap water.

1.28 ESCUTCHEONS

A. Provide chrome plated escutcheons at each sleeved opening into finished and exposed exterior spaces. Escutcheons shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve. Where sleeve extends above finished floor, escutcheon shall clear sleeve extension. Secure escutcheons to sleeve with set screws or other approved devices.

1.29 INSULATION PROTECTION

A. Where exposed insulated piping extends to floor, provide aluminum wrap guard around insulation. Aluminum wrap and straps shall be trimmed to eliminate sharp cutting edges.

1.30 ANCHORING OF EQUIPMENT

A. All equipment located on floor slab that is capable of being moved shall be secured to the floor with anchor bolts. A minimum of two bolts are required per each piece of equipment and bolts shall be of sufficiently size to prevent equipment from overturning.

B. Roof mounted equipment and curb shall be secured to the roof structure in compliance to ICC wind loading provisions.

1.31 PROTECTION OF ELECTRICAL EQUIPMENT

A. Water piping shall not be installed in electrical rooms, unless it serves the room and meets the AHJ's requirements, or directly above electrical equipment.

1.32 CONNECTIONS FOR FIXTURES AND EQUIPMENT UNDER ANOTHER SECTION OR BY OWNER

A. Rough all equipment requiring connection to systems provided under this Division. Verify requirements and current locations before proceeding with work.

B. Make all connections to equipment furnished under another Section or by the Owner as required to obtain complete and working systems.

1.33 SYSTEM GUARANTEE

A. Work required under this Division shall include a minimum one-year guarantee or longer where scheduled or specified elsewhere in the Contract Documents to be duration scheduled or specified. Guarantee by Contractor to Owner to replace any defective workmanship or material which has been furnished under this contract at no cost to the Owner, Architect or Engineer for a period of one year, or longer if so specified in other sections or schedules in the Contract Documents, from date of Substantial Completion. Guarantee shall also include all reasonable adjustments to system required for proper operation during guarantee period. Guarantee shall not include normal preventative maintenance services or filters.

B. Permanent HVAC equipment warranty, including any additional specified or scheduled warranties will not start until the date of the Substantial Completion. If the GC uses the permanent HVAC equipment, with permission form the Architect, Owner and Engineer, the General Contractor shall cover the additional warranty cost for the operation and use of the equipment and pay for any maintenance, filter media (at all return, exhaust or outside air openings if outside air openings are allowed to be opened prior to the Final), utilities, etc. A signed letter from the General Contractor on the General Contractor’s letterhead accompanied by a letter from the equipment manufacturer shall be provided for any piece of equipment started and used during construction stating the specified warranty, including extended warranty will be provided and upheld in full and will not start until the date of Substantial Completion.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 23 05 32

SUPPORTS AND ANCHORS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration and services required for complete installation of all supports and anchors indicated on Drawings and specified within this section.

B. Ductwork, piping, equipment hangers, supports and required anchors.

C. Equipment bases, frames and supports.

D. Flashing and sealing equipment and pipe penetrations.

E. Sleeves and seals.

1.03 REFERENCES

A. American Society of Mechanical Engineers (ASME)

B. American Society of Testing and Materials (ASTM)

C. National Fire Protection Association (NFPA)

1.04 WORK FURNISHED, INSTALLED UNDER OTHER SECTIONS

A. Furnish hangers and sleeve inserts for placement into formwork, framework, structure, slab, etc.

1.05 SUBMITTALS

A. Submit shop drawings and product data for all items listed under this section.

B. Indicate hanger / support framing and attachment methods.

C. Provide hanger / support framing loading limits, location and load of each hanger / support frame.

1.06 SITE CONDITION

A. Do not drill, cut, burn or weld structural members in connection with the installation of pipe supports, bracing and anchorage devices, unless proposed in writing and approved in writing by the Engineer.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Sleeves Through Interior Walls, Floors and Ceilings:
   1. Sleeves through Non-Fire Rated floors: Schedule 40 PVC pipe.
   2. Sleeves through Non-Fire Rated walls, footings, and foundation walls: Schedule 40 PVC 2 pipe sizes larger than service pipe.
   3. Sleeves through beams shall be only in locations and of construction approved by the Structural Engineer.
   4. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 23 05 60.

B. Sleeves Through Exterior Below Grade Walls, Floors and Ceilings:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe.

C. Sleeves Through Exterior Above Grade Walls:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe. Sleeve shall extend 1/8” past finished interior and exterior of wall assembly and painted to match finished wall. Sleeve shall be sealed weather tight.

D. Escutcheons:
   1. Public Areas: Solid plate stainless steel with satin finish.
   2. Non-Public Areas: Split ring chrome plated with set screws.
   3. Size: Minimum one inch annulus shall be provided except at building seismic joints. Building seismic joint pipe sleeves shall be minimum of 5 inches greater than the nominal diameter of the pipe.

2.02 DUCT SLEEVES

A. Exterior Insulated Ductwork: Galvanized steel. Parameter shall be large enough to allow for specified insulation to remain continuous through the penetration. Wall shall be sealed tight to ductwork sleeve by General Works Contractor installing wall assembly.

B. Double Wall Spiral / Internally Insulated Ductwork: Galvanized paint grip steel. Wall shall be sealed tight to ductwork sleeve by General Works Contractor installing wall assembly.

C. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 23 05 60.

2.03 FABRICATION

A. Size pipe sleeves large enough to allow for movement due to expansion and contraction and continuous insulation.

2.04 FLASHING

A. Metal Flashing: paint grip galvanized steel.

B. Lead Flashing: 5 lb/ft^2 sheet lead for waterproofing.

C. Caps: 20 gauge minimum galvanized steel; minimum 16 gauge at fire resistant elements or as required per assembly rating. Caps shall be paint grip when exposed.

2.05 PIPE HANGERS AND SUPPORTS

A. Provide pipe hangers, supports and guides hot-dip galvanized unless otherwise indicated. Provide copper-plated hangers on un-insulated copper pipes.

B. Hangers and support components shall be factory fabricated materials designed.
1. Components shall have hot dipped galvanized coating; electroplate is not acceptable.
2. Strap type hangers shall not be used on any piping system; use only clevis type. The clevis hanger fastener nuts shall be nylon lock type.

C. Anchors for pipe hanger and supports shall be either of the following types as applicable to installation condition:
1. Galvanized metal inserts cast into concrete at time of placing.
2. Anchor bolts for floor mounted equipment may be of a type to be placed in drilled holes and set in place with high strength cement grout.
3. Wedge type, type 316 stainless steel, expansion bolts, anchor bolts set in drilled holes in accordance with manufacturer's instructions. Use of drop-in anchors are prohibited.

2.06 TYPES OF HANGERS

A. Hangers for Cold Pipe: Carbon steel, adjustable clevis.

B. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable clevis.

C. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Vertical Support: Steel riser clamp.

F. Copper Pipe: Carbon steel rings, adjustable, copper plated.

G. Hanger Rods: Mild steel continuous threaded.

H. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms. Size inserts to suit threaded hanger rods.

2.07 ANCHORS AND ANCHORAGE DEVICES

A. Anchors and Bolts: Bolts and studs, nuts and washers shall be Type 316 stainless steel.

B. Fasteners and Accessories: Provide anchors and fasteners, washers, straps and accessories required for a complete and finished installation. Fasteners shall be Type 316 stainless steel.

C. Expansion Bolts: Where anchors are not included in the concrete or masonry construction, anchors shall be Type 316 stainless steel screws or bolts with expansion-shield type concrete or masonry anchors, of sizes and types indicated or required.

2.08 FINISH

A. Concealed: Provide rust inhibiting primer coat to all support, hanger, anchor, etc.

B. Exposed: Provide rust inhibiting primer coat and two finish coats, color to be selected during the submittal phase, to all support, hanger, anchor, etc.

PART 3 EXECUTION

3.01 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

Pipe Size	Maximum Hanger Spacing	Hanger Diameter
1/2” – 1-1/4”	6’-6”	3/8”
1-1/2” – 2”	10’-0”	3/8”
2-1/2” – 3”	10’-0”	1/2”
4” – 6”	10’-0”	5/8”
PVC (all)	6’-0”	3/8”
Cast Iron (all)	5’-0”	5/8”

B. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.

C. Place a hanger within 12” of each elbow.

D. Use hangers with 1-1/2” minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub.

F. Support vertical piping at every floor or every 10 feet whichever is more frequent.

G. Support riser piping independently of connected horizontal piping.

H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. All hangers, hanger rods, supports, etc. shall be double-nutted.

3.02 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete type, minimum 4” thick A.F.F.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed in accordance with the vibration isolation manufacturer’s requirements.

3.03 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

3.04 SLEEVES

A. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.

B. Install escutcheons as described above.

END OF SECTION

SECTION 23 05 53

MECHANICAL IDENTIFICATION

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration and services required for complete installation of all mechanical identification indicated on Drawings and specified within this section.

B. Identification of equipment, piping, valves, controllers, dampers, ductwork, etc.

C. Identification and painting of exposed mechanical piping.

D. Identification and painting of accessible, concealed mechanical piping.

1.03 SUBMITTALS

A. Submit samples and manufacturer's installation instructions for mechanical identification products.

B. Submit valve chart and schedule including valve tag number, size, function, location and valve manufacturer's name and model number.

C. Submit manufacturer's application instructions and color samples for paint products.

PART 2 PRODUCTS

2.01 MATERIALS

A. Nameplates: Laminated three-layer plastic with engraved white letters on black background color.

B. Metal Tags: Brass with 1/2 inch high black filled numbers and/or letters, minimum 1-1/2 inch diameter, brass link chain and hooks.

C. Engraved Metal Tack Markers shall be provide and pop riveted to the Tee Bar main for use of identifying VAV boxes, valves, controls devices, filter access, etc. locations above acoustical tile ceilings. Color to be selected by submittal. Markers shall be numbered with standard 3/16" characters.

D. Paint: Gloss enamel.

E. Stencil Paint: Semi-gloss enamel.

F. Pipe Markers: Equal to Seton Snap Around Pipe Markers. Acrylic plastic with UV inhibitors. Markers shall indicate direction of flow. Legends shall be alternately reversed and repeated for viewing from any angle. Markers shall be factory formed for the installed diameter. Color-coded background, color of legend letter size and length of color field shall conform completely to the latest edition of ANSI A13.1. Legends shall be alternately reversed and repeated for viewing from any angle.

PART 3 EXECUTION

3.01 GENERAL

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with paint manufacturer's requirements.

C. Plastic nameplates shall be installed with corrosion resistant mechanical fasteners.

D. Metal tags shall be installed with corrosion resistant chain.

E. Engraved metal markers should be identified and located on as-built drawings.

F. Provide label maker stickers on the ceiling grid main under a unit's, VAV's, fan's, filter, control damper, fire damper, control panel, valve, etc. location indicating the system or system served. Coordinate with the Architect prior to label installation.

G. Stenciling shall produce neat, high contrast markings. Sizes of markings shall be per the following schedule:

Insulation or Pipe Size	Length of Stencil	Marking Size
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 and Equipment	-	2-1/2"

3.02 PIPING

A. Piping shall be identified at maximum 20 feet on center, at each side of each wall penetration, at each valve and at each connection to equipment. Piping identification shall include type of service, pipe size and direction of flow.

B. Exposed mechanical piping shall be painted with gloss enamel paint and identified per the following schedule:

Type of Service	**Mark**	**Marker / Letter Color**	**Exposed Piping / Lettering Color**
WSHP Loop Water Supply	WSHP LWS	Green / White	Green / White
WSHP Loop Water Return	WSHP LWR	Green / White	Green / White
Chilled Water Supply	CHWS	Blue / White	Blue / White
Chilled Water Return	CHWR	Blue / White	Dark Blue / White
Condenser Water Supply	CWS	Green / White	Green / White
Condenser Water Return	CWR	Green / White	Green / White
Heating Water Supply	HWS	Red / White	Red / White

Heating Water Return	HWR	Red / White	Light Red / White
Hydronic Make-Up Water	HMUW	Brown / White	Brown / White
Evaporator Condensate	CD	Light Blue / White	Purple / White
Chemical Feed Piping	CHEM FEED	Purple / White	Purple / White
Refrigerant Lines	FREON	Green / White	White / Black
Reheat Condenser Water Supply	RHCWS	Orange / White	Dark Orange / White
Reheat Condenser Water Return	RHCWR	Orange / White	Light Orange / White
High Pressure Steam	HPS	Blue / White	Blue / White
Low Pressure Steam	LPS	Blue / White	Blue / White
Condensate Return (Gravity)	CDR	Blue / White	Blue / White
Pumped Condensate Return	PCDR	Blue / White	Blue / White
High Pressure Condensate	HPC	Blue / White	Blue / White
Low Pressure Condensate	LPC	Blue / White	Blue / White
Compressed Air	CA - XXX PSI	Red / White	Red / White
Industrial Cold Water	ICW	Brown / White	Light Brown / White
Industrial Hot Water	IHW	Brown / White	Dark Brown / White
Natural Gas	NAT GAS – XXX PSI	Yellow / Black	Yellow / Black
Liquid Petroleum Gas	LP GAS – XXX PSI	Yellow / Black	Yellow / Black
Chemical Fume Hood Exhaust	CFHE	Purple / White	Purple / White

Note: Piping exposed in finished rooms shall be painted per the direction of the Architect / Owner.

C. Concealed mechanical piping shall be identified with stenciled painting or snap around pipe markers.

D. Refrigerant lines shall be labeled using snap around pipe markers.

3.03 VALVES

A. Valves in main and branch piping shall be identified with metal tags.

B. Provide valve chart and schedule, framed with clear plastic shield. Install at location as directed.

C. All valve locations shall be indicated on “As-Built” Drawings.

3.04 AIR BLEEDS

A. Provide air bleed chart and schedule, framed with clear plastic shield. Install at location as directed.

B. All air bleed locations shall be indicated on “As-Built” Drawings.

3.05 DUCTWORK

A. Ductwork shall be identified with stenciled painting. Identify as to unit number, and area served.

3.06 EQUIPMENT

A. Boilers, base mounted pumps, fans, etc., shall be identified with plastic laminated plates.

B. Large equipment such as fluid coolers, cooling towers, chillers, horsepower rated boilers shall be identified with stenciled painting.

C. Roof top equipment, air handling units, fans, VAVs, etc., shall be identified using plastic nameplates.

D. Small equipment such as in-line pumps shall be identified with metal tags.

E. Starters for mechanical equipment shall be labeled with the corresponding equipment designation using plastic nameplates.

F. Control panels, gauges, instruments and major control components not located at control panels shall be identified with plastic nameplates.

END OF SECTION

SECTION 23 05 91

TESTING, ADJUSTING, AND BALANCING

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.

1.02 DESCRIPTION OF WORK

A. Provide all devices, labor, materials, equipment, administration and services required for all testing, adjusting, and balancing indicated on Drawings and specified herein.

1.03 REFERENCES

A. Associated Air Balance Council (AABC).

B. National Environmental Balancing Bureau (NEBB).

C. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

D. Sheet Metal and Air Conditioning Contractor's Association (SMACNA).

1.04 CONTRACTOR'S QUALIFICATIONS

A. The T&B Contractor shall be certified by either AABC or NEBB.

B. The T&B Contractor shall be an independent contractor from the Mechanical Contractor.

C. The qualifications of this Contractor shall be as follows:

1. Contractor must be a licensed Contractor, specific to this section’s Trade, in the project’s State.
2. The Contractor shall have been in the testing and balancing contracting business for the last five consecutive years, under their current corporation name with more than 75% of the same corporate officers.
3. The Contractor shall have completed at least two projects of comparable size and scope within the past two years without receipt of a Notice to Cure.
4. If Contractor has received a Notice to Cure on any project, that Contractor is excluded from performing work on this project.
5. The Contractor’s main construction and service office shall be located within 60 driving miles distance of the project site unless approval, 10 days prior to project bid date, has been issued in writing by the Owner, Architect and Engineer.
6. The Contractor shall provide substantiating proof of these requirements 10 days prior to project bid date. If substantiating proof is not submitted and approved, the Contractor will not be allowed to bid or work the project.
7. The General Contractor shall not purchase this Contractor’s equipment, materials, etc. All materials, equipment, labor, etc. required to perform the Work herein shall be at the cost of this Contractor.

1.05 SUBMITTALS

A. Qualifications: Within 30 days of Contractor's Notice to Proceed, submit qualifications of agency and personnel, including a sample copy of the AABC National Performance Guaranty. If not submitted within the timeframe specified, the Engineer has the right to choose a T&B Contractor at the Contractor’s expense.

B. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures as specified in Section 3.3, "Preparation."

C. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, T&B agency shall provide system readiness checklists as specified in Section 3.3, “Preparation,” to be used and filled out by the installing contractors verifying that systems are ready for T&B.

D. Examination Report: Provide a summary report of the examination review required in Section 3.1, if issues are discovered that may preclude the proper testing and balancing of the systems.

E. Certified T&B report: Within 10 working days of completion of balancing work, submit AABC or NEBB certified TAB report.

1.06 QUALITY ASSURANCE

A. Agency Qualifications: Engage an independent T&B agency certified by AABC or NEBB.
   1. Supervisor: Employee of the T&B agency who is certified by AABC or NEBB as a TBE.
   2. Technician: Employee of the T&B agency who is certified by AABC or NEBB as a TBT.

B. TBE shall perform the following:
   1. Review field data reports to validate accuracy of data and to prepare certified T&B reports.
   2. Certify that the T&B team complied with the approved T&B plan and the procedures referenced in this Specification.
   3. Certify the T&B report.

C. TAB Report Forms: Use approved forms submitted with the Strategies and Procedures Plan.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in the AABC National Standards for Total System Balance.

1.07 CONTRACTOR RESPONSIBILITIES

A. Provide T&B agency one complete set of contract documents, change orders, and approved submittals in digital and hard copy formats.

B. Controls contractor shall provide required BAS hardware, software, personnel and assistance to T&B agency as required to balance the systems. Controls contractor shall also provide trending report to demonstrate that systems are complete.

C. Coordinate meetings and assistance from suppliers and contractors as required by T&B agency.

D. Provide additional valves, dampers, sheaves and belts as required by T&B agency.

E. Flag all manual volume dampers with fluorescent or other high-visibility tape.

F. Provide access to all dampers, valves, test ports, nameplates and other appurtenances as required by T&B agency.

G. Replace or repair insulation as required by T&B agency.

H. Have the HVAC systems at complete operational readiness for T&B to begin. As a minimum, verify the following:
   1. Airside:
      a) All ductwork is complete with all terminals installed.
      b) All volume, smoke and fire dampers are open and functional.
      c) Clean filters are installed.
      d) All fans are operating, free of vibration, and rotating in correct direction.
      e) VFD start-up is complete and all safeties are verified.
      f) System readiness checklists are completed and returned to T&B agency.
   2. Hydronics:
      a) Piping is complete with all terminals installed.
      b) Water treatment is complete.
      c) Systems are flushed, filled and air purged.
      d) Strainers are pulled and cleaned.
      e) Control valves are functioning per the sequence of operation.
      f) All shutoff and balance valves have been verified to be 100% open.
      g) Pumps are started, and proper rotation is verified.
      h) Pump gauge connections are installed directly at the pump inlet and outlet flange or in discharge and suction pipe prior to any valves or strainers.
      i) VFD start-up is complete and all safeties have been verified.
      j) System readiness checklists are completed and returned to T&B agency.

I. Promptly correct deficiencies identified during T&B.

J. Maintain a construction schedule that allows the T&B agency to complete work prior to occupancy.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 GENERAL

A. All systems are to be tested in occupied and unoccupied, modes and set points, minimum and maximum positions and set points, CO_2 control, special control scenarios found in the Sequence of Control and all values be recorded on the Test and Balance report.

B. Air systems are to be balanced with the Outside Air damper(s) closed and the return duct and take offs damper positions set. Once set, the outside air damper is to opened to its set point position(s) and the return grilles throughout the space be retested and values recorded to match the intent of the Contract Documents.

3.02 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper T&B of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas.

E. Examine equipment performance data including fan and pump curves.

F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and controls are ready for operation.

G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the controls contractor and functioning.

H. Examine strainers to verify that mechanical contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.

I. Examine two-way valves for proper installation and function.

J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.

3.03 PREPARATION

A. Prepare a T&B plan that includes:
1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Prepare system-readiness checklists, as described in the AABC National Standards for Total System Balance, for use by contractors in verifying system readiness for T&B. These shall include, at a minimum:
1. Airside:
   a) All ductwork is complete with all terminals installed.
   b) All volume, smoke and fire dampers are open and functional.
   c) Clean filters are installed.
   d) All fans are operating, free of vibration, and rotating in correct direction.
   e) VFD start-up is complete and all safeties are verified.
   f) Automatic temperature-control systems are operational.
   g) Ceilings are installed.
   h) Windows and doors are installed.
   i) Suitable access to balancing devices and equipment is provided.
2. Hydronics:

a) Piping is complete with all terminals installed.
b) Water treatment is complete.
c) Systems are flushed, filled and air purged.
d) Strainers are pulled and cleaned.
e) Control valves are functioning per the sequence of operation.
f) All shutoff and balance valves have been verified to be 100% open.
g) Pumps are started and proper rotation is verified.
h) Pump gauge connections are installed directly at the pump inlet and outlet flange or in discharge and suction pipe prior to any valves or strainers.
i) VFD start-up is complete and all safeties are verified.
j) Suitable access to balancing devices and equipment is provided.

3.04 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing on each system according to the procedures contained in the latest version of the AABC National Standards for Total System Balance and in this Section.

B. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

C. Air flow balancing shall be done at the individual device, i.e. VAV Box, inlet and run-out manual dampers. Adjusting mass air flow by the Return, Outside or Supply control dampers, i.e. VAV box damper, through a control system setpoint will not be allowed.

D. Hydronic flow balancing shall be done at the individual device balancing valves. Adjusting flow by a control valve through a control system setpoint will not be allowed.

E. Take and report testing and balancing measurements in inch-pound (IP) units.

F. Test and Balance all air and water systems at occupied, unoccupied, minimum and maximum scheduled flow rates, temperatures, etc.

3.05 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare a single-line schematic diagram of systems for the purpose of identifying HVAC components.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check condensate drains for proper connections and functioning.

H. Check for proper sealing of air-handling-unit components.

3.06 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure total airflow as follows:
      a) Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
      b) Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
      c) Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
      d) If a reliable Pitot-tube traverse is not possible, measure airflowat terminals and calculate the total airflow.
   2. Measure fan static pressures as follows:
      a) Measure static pressure directly at the fan outlet or through the flexible connection.
      b) Measure static pressure directly at the fan inlet or through the flexible connector.
      c) Measure static pressure across each component that makes up the air handling system, including final filters, duct heaters, etc.
      d) Report any artificial loading of filters at the time static pressures are measured.
   3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows.
   1. Measure airflow of sub-main and branch ducts.
   2. Adjust sub-main and branch duct volume dampers for specified airflow.
   3. Re-measure each sub-main and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.
   1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
   2. Measure airflow at all inlets and outlets.
   3. Adjust each inlet and outlet for specified airflow.
   4. Re-measure each inlet and outlet after all have been adjusted.

D. Verify final system conditions.
   1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
   2. Re-measure and confirm total airflow is within design.
   3. Re-measure all final fan operating data, rpms, volts, amps, static profile.
   4. Mark all final settings.
   5. Test system in economizer mode. Verify proper operation and adjust, if necessary. Measure and record all operating data.

3.07 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:
   1. Verify that the system static pressure sensor is located 2/3 of the distance down the duct from the fan discharge.
   2. Verify that the system is under static pressure control.

3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control setpoint so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
    a) Adjust controls so that terminal is calling for maximum airflow.
    b) Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c) When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d) Ensure there is a minimum of 0.15 inwc ESP downstream of the terminal unit.
    e) Adjust controls so that terminal is calling for minimum airflow.
    f) Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
5. After all terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
    a) Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
    b) Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
    c) Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    d) Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    e) If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
    a) Measure static pressure directly at the fan outlet or through the flexible connection.
    b) Measure static pressure directly at the fan inlet or through the flexible connection.
    c) Measure static pressure across each component that makes up the air-handling system.
    d) Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
    a) Balance the return-air ducts and inlets the same as described for constant-volume air systems.
    b) Verify all terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure setpoint to the most energy-efficient setpoint to maintain the optimum system static pressure. Record setpoint and give to controls contractor.
9. Verify final system conditions as follows:
    a) Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
    b) Re-measure and confirm total airflow is within design.
    c) Re-measure all final fan operating data, rpms, volts, amps, static profile.
    d) Mark all final settings.
    e) Test system in economizer mode. Verify proper operation and adjust, if necessary. Measure and record all operating data.
    f) Verify tracking between supply and return fans.

10. Record final fan-performance data.

3.08 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils and heat exchangers. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger gpms with pump design flow rate.

B. Verify that hydronic systems are ready for testing and balancing:
   1. Check liquid level in expansion tank.
   2. Check that makeup water has adequate pressure to highest vent.
   3. Check that control valves are in their proper positions.
   4. Check that air has been purged from the system.
   5. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
   6. Verify that motor starters are equipped with properly sized thermal protection.

3.09 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design gpm.
   1. Measure total water flow.
      a) Position valves for full flow through coils.
      b) Measure flow by main flow meter, if installed.
      c) If main flow meter is not installed determine flow by pump total dynamic head (TDH) or exchanger pressure drop.
   2. Measure pump TDH as follows:
      a) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
      b) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
      c) Convert pressure to head and correct for differences in gauge heights.
      d) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
      e) With all valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
   3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

B. Adjust flow measuring devices installed in mains and branches to design water flows.
   1. Measure flow in main and branch pipes.
   2. Adjust main and branch balance valves for design flow.
   3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow measuring devices installed at terminals for each space to design water flows.
   1. Measure flow at all terminals.
   2. Adjust each terminal to design flow.
   3. Re-measure each terminal after all have been adjusted.
   4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
   5. Perform temperature tests after all flows have been balanced.

D. For systems with pressure-independent valves at the terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after all flows have been verified.

E. For systems without pressure-independent valves or flow measuring devices at the terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after all flows have been verified.

F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
2. Re-measure all final pump operating data, TDH, volts, amps, static profile.
3. Mark all final settings.

G. Verify that all memory stops have been set.

3.10 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Adjust the variable-flow hydronic system as follows:
1. Verify that the differential pressure (DP) sensor is located per the contract documents.
2. Determine if there is diversity in the system.

B. For systems with no diversity:
1. Follow procedures outlined in section 3.8 for constant-flow hydronic systems.
2. Prior to verifying final system conditions, determine the system DP setpoint.
3. The pump discharge valve shall be used to set total system flow with VFD at 60 Hz and the VFD shall control system with respect to the DP setpoint.
4. Mark all final settings and verify that all memory stops have been set.

C. For systems with diversity:
1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
3. Follow procedures outlined in section 3.8 for constant flow hydronic systems.
4. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance the terminals that were just opened.
5. Prior to verifying final system conditions, determine the system DP setpoint.
6. The pump discharge valve shall be used to set total system flow with VFD at 60 Hz and the VFD shall control system with respect to the DP setpoint.
7. Mark all final settings and verify that all memory stops have been set.

3.11 GENERAL PROCEDURES FOR ELECTRIC HEAT SYSTEMS

A. Prepare test reports for electric duct, VAV and / or unit heaters. Obtain approved submittals and any manufacturer-recommended testing procedures.

B. Verify that electric heat systems are ready for testing and balancing:
1. Check air flow proving switch.
2. Check heater kW, voltage and amp draw.
3. Check that control dampers are in their proper positions for heating CFM.
4. Check safety limits and controls.
5. Check entering and leaving temperatures.
6. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
7. Verify that motor starters are equipped with properly sized thermal protection.

3.12 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: Plus or minus 10 percent.
   2. Air Outlets and Inlets: Plus or minus 10 percent.
   3. Minimum Outside Air: Zero to plus 10 percent.
   4. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.
   5. Heating-Water Flow Rate: Plus or minus 10 percent.
   6. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.13 FINAL TEST & BALANCE REPORT

A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.

B. The report must be organized by systems and shall include the following information as a minimum:
   1. Title Page:
      a) Company Name
      b) Company Address
      c) Company Telephone Number
      d) Project Identification Number
      e) Location
      f) Project Architect
      g) Project Engineer
      h) Project Contractor
      i) Project Number
      j) Date of Report
      k) AABC Certification Statement
      l) Name, Signature, and Certification Number of AABC TBE
   2. Table of Contents:
   3. AABC National Performance Guaranty
   4. Report Summary
      (1) The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
   5. Instrument List
      a) Type
      b) Manufacturer
      c) Model
      d) Serial Number
      e) Calibration Date

   6. T&B Data
      a) Provide test data for specific systems and equipment as required by the most recent edition of the AABC National Standards.

C. One copy of the final test and balance report shall be sent directly to the engineer of record. Provide five (5) additional copies to the contractor.

END OF SECTION

SECTION 23 07 10

DUCTWORK INSULATION

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.

1.02 SUMMARY

A. Perform all Work required to provide and install ductwork insulation and jackets indicated by the Contract Documents with supplementary items necessary for proper installation.

1.03 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

D. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
1. ASTM C168 - Terminology Relating to Thermal Insulation Materials.
2. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
4. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
5. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
6. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
7. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
8. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
9. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
10. ASTM E84 - Surface Burning Characteristics of Building Materials.
11. ASTM E96 - Water Vapor Transmission of Materials.
12. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
13. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
14. NFPA 255 - Surface Burning Characteristics of Building Materials.
15. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

16. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.
17. UL 723 - Surface Burning Characteristics of Building Materials.
18. ASTM E2336 - Standard for Grease Ducts.
19. 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

1.04 QUALITY ASSURANCE

A. All ductwork requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Contractor Qualifications: Contractor performing the Work of this Section must have minimum five (5) years experience specializing in the trade. Insulation Contractor must be separate from the Mechanical Contractor.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

1.05 SUBMITTALS

A. Product Data:
1. Provide product description, list of materials, "k" value, "R" value, mean temperature range, and thickness for each service and location.

B. Operation and Maintenance Data:
1. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.
2. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to the Project Site under provisions of Division 01.

B. Deliver materials to Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

D. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MANUFACTURERS

A. CertainTeed Corporation.

B. Johns Manville Corporation.

C. Knauf Corporation.

D. Owens-Corning.

E. Armacell North America.

F. Unifrax 1 LLC. (FyreWrap)

G. 3M Fire Protection Products (Fire Barrier Duct Wrap 615+)

2.03 INSULATION MATERIALS

A. Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75°F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

B. Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75°F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

C. Type D3: Ductliner (ONLY to be used when indicated on the Drawings), Closed Cell Flexible Elastomeric Insulation equal to AP Armaflex; 1 inch thick material that has a service temperature range from –297°F to 220°F. This outdoor duct insulation meets ASTM C 534 and shall have minimum ‘k’ value of 0.25 Btu-in. / hr-ft2- °F at minimum density measurement at 75°F. The insulation shall be resistant to mold growth, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

D. Type D4: Fire Rated Grease Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000°F; aluminum foil laminated on both sides; with a minimum ‘k’ value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E 2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.

E. Type D5: Outdoor Duct Insulation (Closed Cell Flexible Elastomeric Insulation); 2 inch thick material that has a service temperature range from –297°F to 220°F. This outdoor duct insulation meets ASTM C 534 and shall have minimum ‘k’ value of 0.25 Btu-in. / hr-ft2- °F at minimum density measurement at 75°F. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:

1. Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.
2. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.
3. Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

2.04 INSULATION ACCESSORIES

A. Adhesives: Waterproof vapor barrier type, meeting requirements of ASTM C916; Childers CP-82 or Foster 85-20.

B. Weather Barrier: Breather Mastic: Childers CP-10/CP-11 or Foster 46-50 White.

C. Vapor Barrier Coating: Permeance - ASTM E 96, Procedure B, 0.08 perm or less at 45-mil dry film thickness, tested at 100F and 50%RH; Foster 30-65 or Childers CP-34.
   1. When higher humidity levels may be of concern, only specify the following fungus/mold resistant coating: Foster 30-80 AF (anti fungal). Coating must meet ASTM D 5590 with 0 growth rating.

D. Reinforcing Mesh: 10x10 or 9x8 glass mesh; Foster Mast a Fab or Childers #10.

E. Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq yd.

F. Type D4 Insulation Adhesive: Fire resistive to ASTM E84, Childers CP-82 or Foster 85-20.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Joint Tape: Glass fiber cloth, open mesh.

I. Tie Wire and Wire Mesh: Annealed steel, 16 gage.

J. Stainless Steel Banding: 3/4-inch wide, minimum 22 gage, 304 stainless.

K. Armaflex 520, 520 BLV, or Foster 85-75 contact adhesive.

L. Armatuff 25 white seal seam tape.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

C. Maintain required ambient temperature during and after installation for a minimum period of 24 hours.

3.02 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.

D. Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure insulation to the top of ceiling diffusers with adhesive that meets NFPA 90A and 90B 25/50 requirements, and vapor barrier or tape to match jacket. Do not insulate top of ceiling diffuser if it is used in ceiling return air plenum or in an open space with no ceiling.

E. Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:
1. Secure insulation jacket joints with vapor barrier adhesive or tape to match jacket.
2. Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
3. Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating.
4. On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.
5. Vapor seal all seams, joints, pin penetrations and other breaks with vapor barrier coating reinforced with reinforcing mesh.

F. Duct Liner (Type D3):
1. Follow the manufacturer's installation requirements including the duct preparation for adhesive.
2. Secure insulation with 100 percent coverage of duct liner manufacturer's adhesive, pins and clips not more than 18 inches on center.
3. Secure bottom of duct insulation using alternate single and double clips. The first pin will secure the insulation and the second clip will be used to secure the cladding. Isolate the exterior clip from the cladding by using two 1/8 inch closed cell neoprene (Armaflex) washers on either side of the cladding. Predrill holes in cladding and avoid contact with pin during installation.
4. For joints and overlaps, fold cladding to form a double thickness hem 2 inches minimum. Seal with a non-shrink, non-hardening sealing compound.

G. Insulation (Type D4) application for exterior of grease ducts:
1. External duct wrap system requires two (2) 1.5-inch layers of lightweight, flexible wrap overlapped to provide an effective fire barrier. The barrier is installed in 24-inch or 48-inch wide sections. Insulation pins are welded in certain locations to maintain the fire barrier material up against the duct.
2. Grease duct doors to be installed so the door can be removed and re installed and meet code requirements.
3. Install duct wrap as tested per manufacturer's instructions to assure the duct wrap is mechanically attached per the manufacturer's spacing of bands or weld pins.
4. Vertical and horizontal members of the support hanger system shall be wrapped with one layer of the insulation. Vertical and horizontal portions shall be wrapped independent of

one another. The horizontal hanger shall be removed from the vertical support rods and wrapped and then immediately replaced so that an adjacent horizontal support can be removed, wrapped, and reinstalled. The end of the threaded vertical rod shall extend 6-inch past the horizontal member at the beginning of the installation.

5. Penetrations: Where ducts penetrate fire rated walls, floors and roofs, the duct wrap shall be used in conjunction with a firestop system that is listed by a nationally recognized laboratory and rated for penetration of a rated wall or floor by the fire rated grease duct system used.

H. Insulation (Type D5) application for outdoor ducts:
1. Horizontal ductwork located outdoors shall be sloped at a minimum 2-degree angle to prevent the accumulation of water on top of the finished insulated duct. Support members that connect directly to the ductwork are to be insulated with this same material. Keep compression or sharp creases of outdoor insulation to a minimum by distributing the weight of the duct resting on horizontal duct support members.
2. Follow the insulation manufacturer's installation instructions and procedures to assure the ductwork is properly insulated and that the insulation will meet the manufacturer's warranty requirements.

I. All ductwork, accessories, and all plenums including metal and masonry, gypsum construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.

J. Flexible ductwork connections to equipment shall be insulated.

K. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

L. Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.

M. Where canvas finish is specified use lagging adhesive/coating to prevent mildew in securing canvas. Do not use wheat paste. Use only anti-fungal lagging adhesive that adheres to ASTM D 5590 with 0 growth rating. (Foster 30-60, Childers CP-137AF). In addition, cover all exterior canvas-covered insulation with a fire-retardant weather barrier mastic.

N. Flexible round ducts shall be factory insulated.

3.03 INSPECTION

A. Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.

B. Where there is evidence of vapor barrier failure or "wet" insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

3.04 DUCTWORK INSULATION APPLICATION AND THICKNESS SCHEDULE

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air (Hot, Cold, Combination)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	1-1/2"
Return Air, Relief Air, and Exhaust Air	All	D1	2"
Outside Air	Treated and Untreated	D1	2"
Supply, Return and Outside Air	Concealed Outside Building Insulation Envelope (i.e. Attic)	D1	3”
Kitchen Grease Hood Exhaust Air	All	D4	3"
Duct mounted coils	Inside of Mechanical Rooms	D2	2”
Terminal Unit Heating Coils	All	D1	2”
Air Diffusers, Grilles, Registers	Top of Device	D1	2"
Supply Air Duct	Outdoor Environment	D5	2”
Return, Exhaust Air Duct	Outdoor Environment	D5	1-1/2"

END OF SECTION 23 07 10

SECTION 23 07 40

INSULATION FOR CONDENSATE DRAINS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration, equipment and services required for complete installation of all insulation for condensate drains indicated on Drawings and specified in this section.

1.03 CONTRACTOR'S QUALIFICATIONS

A. This work shall be performed by a skilled insulation contractor whose primary business is the installation of insulation systems and who has been in this business for a minimum of 5 years and has successfully completed 2 projects of similar size and scope.

1.04 SUBMITTALS

A. Submit product literature for each insulation type, finish type and equipment served. Provide submittals on method of installation for each type of insulation used.

PART 2 PRODUCTS

2.01 THERMAL INSULATION

A. All insulating systems shall be tested on a composite basis in accordance with NFPA and UL 723 and shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 under ASTM E-84.

2.02 INSULATION TYPES

A. Closed cell, flexible elastomeric thermal insulation, black in color, supplied in unslit tubing. Equal to Armaflex AP 2000.

B. Closed cell, elastomeric thermal insulation tape. Commonly supplied in 2" x 1/8" thick. Equal to Armaflex insulation tape.

2.03 ADHESIVES

A. Equal to Armstrong 520 adhesive, air drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000.

2.04 FINISHES

A. A white, elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel. Equal to WB Armaflex finish.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All materials shall be applied by craftsmen skilled in this trade. Unsightly work shall be cause for rejection.

B. All joints shall be mitered. No exceptions.

C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.

D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and four times the pipe diameter in length shall be installed at hangers to eliminate through-metal conductance. Provide 18 gauge, 180°, galvanized sheet metal saddles same length as block supports.

3.02 APPLICATION

A. Insulation shall be butted together and adhered in place with joint adhesive. All joints and seams shall be sealed with contact adhesive. Insulation shall be butted firmly to equipment and adhesive applied. Insulation shall be slipped on without slitting where possible.

B. Paint all exposed insulation with a minimum of two coats of Armaflex white paint.

C. Provide sheet metal saddles for all insulated condensate piping at pipe supports.

3.03 INSULATION THICKNESS

A. Provide 1/2" thick insulation materials for all condensate piping.

END OF SECTION

SECTION 23 11 23

FUEL GAS PIPING

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.

1.02 DESCRIPTION OF WORK

A. Provide all administration, labor, materials, equipment and services required for complete installation of all natural gas piping indicated on Drawings and specified herein.

B. Gas service, specialties and piping to all gas appliances.

1.03 REFERENCES

A. All installation and fabrication shall be in accordance with current applicable State and Local Gas Codes, adopted International Building, International Fuel Gas Code and governing code for this project.

1.04 SUBMITTALS

A. Submit manufacturer's catalog data for all of the following materials and equipment:
   1. Submit catalog data and shop drawings for all materials listed under this section.
   2. All materials, devices and appliances shall be new, without defect, first line quality unless specified otherwise.
   3. The supplier, by submitting, certifies the materials and equipment to be satisfactory for the application involved.
   4. Materials, valves, hangers or equipment installed without review or after rejection shall be replaced by this contractor with acceptable items at the Engineer's direction.
   5. Contractor agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the Engineer, the Contract Documents shall control and be followed.
   6. Contractor’s certification and State gas cards. Contractor shall indicate project’s Master Gas Fitter and Journeyman Fitter. Project shall be supervised, on site, by the Master Gas Fitter.
   7. Pressure test shall be signed by the project’s Master Gas Fitter.

PART 2 PRODUCTS

2.01 PIPING

A. Above Grade:
   1. Steel pipe: ASTM A53, Schedule 40 black.
   2. Fittings: ANSI/ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
   3. Joints: Screwed for pipe 2" and under; ANSI/AWS D1.1, welded, for pipe over 2".

B. Below Grade:

1. MDPE pipe conforming to ASTM D 2513. Pipe shall be marked “GAS” and “ASTM D 2513”. Verify pipe preference of local utility. Provide yellow indicator tape with an insulated copper tracer wire the continuous pipe length. The wire shall terminate above ground at each end of nonmetallic piping. The tracer wired shall not be less than 18 AWG and the insulations type shall be suitable for direct burial.
2. Steel Pipe: Schedule 40, black, per ASTM A-53 may be substituted for MDPE outside underground pending written approval by the Engineer 10 days prior to bid. Piping shall be factory coated with a fusion bonded epoxy coating equal to 3M Scotchkote 6233.
   a) Fittings: Malleable iron per ASTM A-105 or forged steel welding type per ASTM A-234.
   b) Joints: Welded per ANSI/AWS D1.1 for all pipe sizes.
   c) Fittings and joints shall be covered with multiple layers of protective tape to provide protection equal to factory applied coatings. Tape shall be Kendall Company "Polyken #900" or equal by Tapecoat, 3M or Steelcoat.

C. High Pressure System (containing 1 psig or greater) pipe shall meet specifications listed above.
   1. Fittings: Forged steel welding type per ASTM A234.
   2. Joints: All sizes shall be welded. Where nonferrous pipe is brazed, the brazing materials shall have a melting point in excess of 1,000°F. Brazing alloys shall not contain more than 0.05% phosphorus.

D. Flexible Connectors: Flexible connectors for connecting gas utilizing equipment to building gas piping shall conform to ANSI Z21.45. Flexible connectors for movable food service equipment shall conform to ANSI Z21.69.
   1. All flexible connectors shall be commercial grade construction.

E. All welded joints on above grade piping 2” and larger shall be butt welds. 1-1/2” piping and smaller may be socket welds.

2.02 FUEL GAS SPECIALTIES

A. Pressure Regulators:
   1. Pressure regulators for individual service shall be of iron or steel body, shall be suitable in all respects for the indicated conditions and shall be adjustable for changing the downstream pressure. The regulator shall be adjustable with automatic loading, and shall have automatic pressure relief. The regulator shall be adjusted for an outlet pressure as scheduled on plans. The outlet pressure shall not vary more than 1/2 inch of the water column from the setting point at the connected-load capacity for the regulator. The pressure relief shall be diaphragm-operated, spring-loaded type with vent for relief of excess pressure on the low-pressure side of each main service regulator. Regulators shall be Maxitrol, Equimeter, American, and Fisher or approved equal.
   2. Pressure regulators shall be configured where the vent is oriented as required by the manufacturer.
   3. Pressure regulators installed inside the building shall have the vents routed to the exterior. Piping used shall be sized for the vent connection and as required by the regulators manufacturer with relation to overall equivalent length. The vent piping shall be leak tested at 25psig of air for a minimum of 4 hours.
   4. Increasers installed on the low pressure side of the pressure regulator shall be installed immediately after the regulator. A full port ball valve and union, rated for gas utility and applicable pressure, shall be installed at the inlet and out let of the regulator.
   5. Testing procedures shall not include testing thru or to a gas pressure regulator. The Mechanical Contractor shall install a short of piping with the same length in place of the

regulator. The regulator shall be installed after the test is approved. The regulator shall be pressure tested with soap bubbles or approved electronic leak detector after installation.

B. Stop Cock Valves:
1. Stop cock valves shall carry an ASME B16.33 rating. Valves shall be equal to Kitz model # 58 with a vented ball and blowout proof stem.

PART 3 EXECUTION

3.01 GENERAL

A. Work shall be roughed-in so that all exposed piping will be straight and true without bends or off-sets.

3.02 FUEL GAS PIPING SYSTEM

A. Provide a complete system of gas piping including interior and exterior work as indicated on the drawings. All pressure gauges shall be installed with a gauge cock and damper device. Gauges shall be installed in such a position to be easily read.

B. Pressure testing procedure:
1. High pressure piping (> ½" psig): Gas pipe shall be tested with nitrogen at 50 psig or 1.5 times the system's working pressure for 24 hours and measured with a pressure measuring device designed and calibrated to read, record and indicate a pressure loss due to pipe leakage during the pressure test period. Any reduction of test pressure as indicated by the device shall be deemed to indicate the presence of a leak. Any leaks shall be located by means of a spray liquid & soap solution, or an equivalent nonflammable solution. The piping shall be rinsed with water after soap and water testing. Any leaks shall be repaired by this Contractor and the system re-tested in the prescribed manner. The 24 hour chart readout shall be submitted to the Engineer with a verification of the time, date and witness of the testing procedures.
2. Low pressure piping (½" < psig): Gas pipe shall be tested with 10 psig nitrogen pressure for 24 hours and measured with a pressure measuring device designed and calibrated to read, record and indicate a pressure loss due to pipe leakage during the pressure test period. Any reduction of test pressure as indicated by the device shall be deemed to indicate the presence of a leak. Any leaks shall be located by means of a spray liquid & soap solution, or an equivalent nonflammable solution. The piping shall be rinsed with water after soap and water testing. Any leaks shall be repaired by this Contractor and the system re-tested in the prescribed manner. The 24 hour chart readout shall be submitted to the Engineer with a verification of the time, date and witness of the testing procedures.

C. This Contractor shall make final connections to each piece of equipment furnished by the Contractor or by others unless noted otherwise. Provide a full size shut-off cock, union and 4" dirt leg at each individual appliance connection. Any reduction in gas pipe size for equipment connection shall be made within 6" of the factory connection. Regulators shall be installed at each piece of equipment or at branch intervals where required and indicated on the Drawings.

D. Gas piping shall not be installed in any inaccessible concealed and unventilated space.

E. Install piping with a minimum 48" clearance from other buried metallic piping or equipment.

F. Unless otherwise specified herein, final connections shall be made with rigid metallic pipe and fittings. Final connection to kitchen ranges, (and other equipment where moving for cleaning purposes is required) shall be made using flexible connectors not less than 40" long and not more than 72" long and shall comply with ANSI Z21.69. In addition to cautions listed in instruction required by ANSI Standards for flexible connectors, ensure that flexible connectors do not pass through equipment cabinets. Provide accessible gas shutoff valve and coupling for each gas equipment connection.

G. Exterior piping above grade and concealed from normal view shall be coated with a rust inhibiting primer and two coats of yellow exterior grade paint. For exposed gas piping in normal view, piping shall be primed as previously listed and painted with a color similar to nearest structure or as directed by the Architect / Engineer.

H. Whenever gas pipe transitions from below grade to above grade, the transition shall be made with an isolating union to electrically isolate the gas distribution systems. A DC voltage reading shall be made to test the effectiveness of the isolating unions. A minimum reading of 0.2 volts (measured across the union) shall be required. Repair or replace unions until this voltage can be obtained.

I. The condition of the pipe coating, the effectiveness of the isolation shall be tested and approved by the Engineer.

J. All underground piping shall be buried a minimum of 24 inches, have a pipe marker located 6 inches below finish grade, and shall be laid in a minimum of 4 inches of sand with sand extending to 6 inches above pipe. Provide a conduit of wrought iron, plastic pipe or steel pipe, designed to withstand superimposed loads, below all concrete sidewalks, roadways or concrete pads. Sleeve shall be a minimum of 2 pipe sizes larger than gas line. Sleeves shall be sealed and vented if installed under the building. Vents shall be routed as detailed and shown on the drawings.

END OF SECTION

SECTION 23 21 14

CONDENSATE DRAIN PIPING SYSTEMS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration, equipment and services required for complete installation of all condensate drain piping systems indicated on Drawings and specified herein.

1.03 REFERENCES

A. American National Standards Institute (ANSI).

B. American Society of Mechanical Engineers (ASME).

C. American Society of Testing and Materials (ASTM).

1.04 SUBMITTALS

A. Submit manufacturer's catalog data for all materials listed under this section.

PART 2 PRODUCTS

2.01 PIPING

A. Condensate drain piping shall be one of the following:
   1. Type L hard drawn copper per ASTM B-88. Fittings are to be wrought copper or cast brass. Joints are to be soldered with lead free, tin-silver solder.
   2. PVC Pipe and Fittings: Schedule 40 per ASTM D-1785 / ASTM D-2466. Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.

2.02 OVERFLOW DRAIN PANS

A. Contractor shall provide a condensate pan under all equipment capable of producing condensation. An overflow pan shall be provided in the case of furnaces upstream of an evaporator coil. Overflow pans shall extend 2 inches on all sides of a furnace and evaporator coil combination.

B. Condensate overflow drain pans are to be fabricated from minimum 24 gauge galvanized steel and shall have joints welded water tight. Folded corners will not be allowed. The use of silicone to seal joints will not be allowed.

C. Drain pan minimum dimensions shall be two inches deep and shall be two inches larger on all sides than the piece of equipment it is under. All drain pans with any dimension greater than

24" shall be cross broken. The top of the pan shall be hemmed on all sides to remove all exposed sharp edges.

D. All condensate pans shall be equipped with a liquid sensing switch either integrated into the system served and / or building controls system.

PART 3 EXECUTION

3.01 GENERAL

A. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor. Coordinate with all Trades.

B. Piping shall be cut to site specific measurements, worked into place without forcing, located as indicated on the Drawings and supported per piping manufacturer's and Code requirements. Piping shall be supported as high as possible. Piping shall be concealed unless otherwise noted.

C. Provide chrome plated steel escutcheon plates at each exposed piping penetration of walls and ceilings. Escutcheon plates for insulated piping shall be sized for the insulation diameter.

3.02 CONDENSATE DRAIN PIPING

A. Slope piping at a uniform slope of at least 1/4" inch per foot to ensure proper drainage.

B. Provide a vent on the trap if the discharge height is ten feet or greater.

C. Provide condensate drain trap with a depth at least two inches greater than the fan total static pressure as measured from the invert of unit connection to the discharge invert. Pre-formed traps will be allowed. Provide threaded cleanouts at the top and bottom of the trap.

D. Condensate drain lines shall be adequately supported to prevent low points which could cause double trapping. Piping shall be supported at minimum intervals specified in other sections or per the pipe manufacturer's requirements, whichever is greater.

E. Condensate drain lines indicated to be terminated at floor drains shall either be turned down through / past the floor drain grate or be provided an indirect waste funnel for the floor drain.

3.03 DRAIN PANS

A. Drain pans shall be installed under every piece of equipment that produces condensate.

B. Equipment shall be held up off the bottom of the drain pans with rubber in shear isolators. The isolators shall be located above rigid supports beneath the pan. Provide additional supports as needed for required trap depth.

C. All drain pans shall be equipped with a liquid sensing switch either integrated into the system served and / or building controls system.

END OF SECTION

SECTION 23 31 10

GALVANIZED SHEET METAL DUCTWORK

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.

1.02 DESCRIPTION OF WORK

A. Provide all material fabrication, labor, administration, equipment and services required for complete installation of all galvanized sheet metal ductwork indicated on Drawings and specified herein.

1.03 REFERENCES

A. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE).

B. National Fire Protection Association (NFPA).

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

D. Air Diffusion Council (ADC).

E. Air Movement and Control Association (AMCA).

F. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

A. Submit catalogue data and shop drawings for all materials and equipment listed under this section.

PART 2 PRODUCTS

2.01 FABRICATION

A. All sheet metal ductwork shall be fabricated and installed in accordance SMACNA standards unless more stringent requirements are stated herein.

2.02 GALVANIZED SHEET METAL DUCTWORK

A. Sheet Metal Ductwork:
   1. Galvanized steel ductwork shall be carbon steel, of lock-forming quality, hot dip galvanized, with regular spangle-type zinc coating, conforming to ASTM A-527/A527M-G90.
   2. Sheet metal gauges and reinforcement shall conform to the latest edition SMACNA HVAC duct construction standards. 26 gauge will be the lightest gauge allowed for all ductwork.

3. All ductwork, including hangers, drives, flanges, accessories, etc., exposed in occupied areas shall also have a paint grip finish.

2.03 DUCTWORK SEALANT

A. Sealant shall be non-flammable when wet, fire resistive when dry, and suitable for use in high velocity ductwork. Shall meet NFPA 90A and 90B and be UL classified. Sealant shall have a maximum 25 flame spread and 50 smoke developed compound specifically for sealing ductwork.

B. Duct Tape will not be allowed.

2.04 DUCTWORK ACCESSORIES

A. General: Provide duct accessories as indicated on the drawings and as required for proper system operation and balance.

B. Flexible Duct Connections: Flexible duct connections shall be UL listed fire retardant neoprene coated woven glass fiber fabric connections, shall conform to NFPA 90A and 90B and have a maximum flame spread rating of 25 and a maximum smoke development rating of 50. Flexible duct connectors shall be factory insulated equal to DuroDyna IDC-343 Insulflex.

C. Manual Balancing Dampers:
1. Dampers in rectangular ductwork shall be equal to shall be Ruskin model CD-60, opposed blade type, complete with concealed linkage and extended shaft for the damper quadrant or motorized operator, 16 gauge frame and double skin airfoil blades with the equivalent thickness of 14 gauge. The axle is to be 1/2" plated hex steel with stainless steel or oil impregnated bearings. Blades shall have neoprene edge seals and compression jamb seals. Dampers listed as 8" x 10" or smaller shall be single blade.
2. Dampers in round ductwork shall be equal to Ruskin model CDRS25, single blade. Blade shall be two layers of galvanized steel with the equivalent thickness of 14 gauge. A neoprene seal shall be sandwiched between the two blades. The damper axle shall be 1/2" diameter and extend 6" beyond the frame for the damper quadrant or motorized operator and shall be installed in stainless steel or oil impregnated bronze bearings.

D. Barometric Relief Dampers: Ruskin model CBD2 adjustable counter balance damper. Damper to relieve air differentials less than 0.01” w.g.

E. Damper Quadrants: Damper quadrants shall have indicators showing open, incremental and closed positions.

F. Motorized Dampers: Motorized dampers shall be the same as the manual dampers with the addition of a motorized operator, specified as follows:
1. Two Position Motorized dampers shall be controlled with Belimo model NF24-S-US, 24 volt, 60 in-lb torque with 75 second run time, spring return and built in auxiliary switch. Actuators shall be factory mounted to the dampers.
2. Fully Modulating Motorized dampers shall be controlled with Belimo model NF24-SR-S-US, 24 volt, 60 in-lb torque, spring return and built in auxiliary switch. Actuators shall be factory mounted to the dampers.

G. Turning Vanes: All turning vanes shall be single thickness with a 2" radius, installed on runners with 2-1/8" blade spacing. Blades shall be 26 gauge.

H. Adjustable Splitter and Volume Dampers: Rectangular duct mounted splitter dampers and adjustable volume extractors shall be fabricated form 16-gauge steel with a hemmed leading edge. The trailing edge shall be pivoted on a rod or hinges. Install in accordance with the latest edition a SMACNA's Low Velocity Manual and as detailed on the drawings. Secure rod to leading edge of damper and extend rod through side of ductwork using Ventlock 603 ball joint bracket with set screw.

I. Access Doors:
   1. Duct Access Doors shall be UL labeled, galvanized steel, double panel construction (paintable when duct is exposed, see Drawings), internally insulated with minimum 1-inch thick fiberglass insulation complete with gaskets.
      a) Rectangular, Low Pressure Duct: Ductmate Industries, 24 gauge with hinged frame connection and cam lock closures. Doors shall be 16”x16” or as large as possible.
      b) Rectangular, High Pressure Duct: Ductmate Industries FDHPC, 24 gauge galvanized panel, 22 gauge frame with 16 gauge camlock closures on all sides. Provide safety chain(s).
      c) Round, Low and High Pressure Duct: Ductmate Industries, 22 gauge, spiral compression with conical springs and hand knobs.
   2. The location of the access doors shall be coordinated for easy access to the fire damper fusible links.

2.05 45 DEGREE, SQUARE-TO-ROUND TAKEOFF FITTINGS

A. All branch duct takeoffs to a single air distribution device, shall be made using a rectangular, 45 degree takeoff that transitions to the round duct size shown on the plans. Branch ducts from a round main shall be the same as above with the exception that the rectangular portion shall match the curvature of the main.

B. The takeoff shall be fabricated from G-90 galvanized steel, 4” W.G. construction.

C. Takeoff shall have a 1" wide gasketed flange with pre-drilled screw holes.

D. All sizes shall be fabricated with a damper handle insulation standoff.

E. Take off shall be Flexmaster STOD-BO3 for rectangular duct and AirFlow #63RATD-2 for round duct or equal.

2.06 INSULATED FLEXIBLE DUCTWORK

A. Insulated flexible duct shall be listed under UL standard 181 as Class 1 air duct and shall comply with NFPA standards 90A and 90B. The duct shall be 25/50 rated for flame spread/smoke developed.

B. The duct shall be constructed with an acoustically transparent CPE film mechanically locked to a corrosion resistant galvanized steel wire helix.
   1. The duct shall be insulated with a factory applied fiberglass blanket. Insulation R-value for duct shall be R-8.0.

C. The vapor barrier shall be a fire retardant, reinforced, metalized outer jacket with a permeance of 0.05 perm.

D. Flexible ductwork shall be rated for 10 inwg. positive pressure and 5 inwg. negative pressure through 16" diameter. Flexible duct on sizes greater than 16" shall not be used however a flex

connector shall be used to separate the sheet metal duct from the unit or grille connection. The rated temperature range shall be –20 to 250°F. The UL rated velocity shall be 6000 fpm.

E. Insulated flexible duct shall be Flexmaster Type 1M.

F. Flex duct shall have a 20 year factory warranty.

2.07 DUCT SUPPORTS

A. General:
1. Duct supports shall be placed within four feet on every side of each branch intersection and within two feet on either side of an elbow.
2. If spacing of the building structural members is greater than the maximum allowed for duct supports, additional structural members, adequate to support duct and insulation, shall be placed to span the building structural members to provide support for the ducts.

B. Rectangular Ductwork:
1. Rectangular ductwork shall be supported at a maximum of every four (4) feet using a pair of 1" straps fabricated from 20 gage sheet metal or two 3/8" diameter all thread rods. The supports shall be attached to the duct and the building structure in accordance with SMACNA standards. This shall apply to all rectangular ducts up to a maximum half of duct perimeter of 120".
2. For ducts with a half of duct perimeter greater than 120", the gauge of the support straps and size of the rods shall be in accordance with SMACNA standards.

C. Round Ductwork:
1. Round ductwork up to 36" diameter shall be supported at a maximum of every eight (8) feet using a single 1" strap fabricated from 20 gage sheet metal or 3/8" rod. The supports shall be attached to the duct and the building structure in accordance with SMACNA standards.
2. Round ducts greater than 36" diameter, shall be supported by straps or rods sized in accordance with SMACNA standards.

D. Flexible Ductwork:

1. Flexible duct shall be supported by single 1" strap fabricated from 26 gage sheet metal.

PART 3 EXECUTION

3.01 GALVANIZED SHEET METAL DUCTWORK

A. Sheet Metal Ductwork shall be fabricated and installed per the latest edition of the SMACNA HVAC duct construction standards and the ASHRAE Handbook.

B. All ductwork shall be supported in accordance with SMACNA standards. All threaded rod supports shall be double nutted.

C. Duct transitions shall be fabricated and installed per SMACNA standards and shall not choke flow or reduce the free area of the duct.

D. All rectangular duct elbows shall be fabricated in accordance with either of the following:
1. Radius Elbow: All radius elbows shall have a centerline radius equal to 1.5 times the width of the duct. This results in an inside radius equal to the width of the duct. Under no

circumstances will radius elbows with a centerline radius of 0.5 times the duct width and an inside radius of 0.0 (90 degrees angle throat and radius heel) be allowed.

2. Mitered Elbow: All mitered elbows with an angle over 45 degrees shall be provided with turning vanes.

E. All duct sizes shown on plans are net free area. Contractor shall allow for insulation thicknesses.

3.02 DUCT SEALANT

A. All duct systems shall be sealed to meet SMACNA Seal Class B. All transverse and longitudinal seams in all ducts shall be sealed.

3.03 FIELD QUALITY CONTROL

A. Duct Cleanliness – Installation of ductwork under this section shall comply with the "Intermediate" requirements defined within the SMACNA "Duct Cleanliness for New Construction Guidelines" (2000). It is the responsibility of the installing contractor to wipe down the interior of the duct prior to installation and to cap all open duct ends once installed.
   1. Leakage Tests:
      a) Leakage tests shall be performed on all systems.
      b) Testing methods shall be in accordance with the SMACNA HVAC Duct Leakage Test Manual. The scope of testing will exceed the recommendations of the Manual.
      c) Representative sections totaling no less than 25% of the total installed duct area for the designated pressure class shall be tested. Should any portion fail to achieve the designated leakage rate, an additional 25% percent of the total installed duct area shall be tested. Should any portion of this additional duct fail to achieve the designated leakage rate all duct must be tested.
      d) All sections shall be selected by the building owner or the designated representative of the building owner.
      e) Positive pressure leakage testing is acceptable for negative pressure ductwork.
      f) Any duct failing the pressure test will be resealed and retested, at no extra expense to the owner, until the appropriate leakage rate is achieved.

3.04 DUCTWORK ACCESSORIES

A. Flexible duct connections shall be installed on all ductwork required to be attached to motor driven equipment.
   1. The ends of the flexible connection shall be overlapped and sealed, to prevent air leakage, per the manufacturer's recommendations.

B. Manual Balancing, Splitter and Quadrant Dampers:
   1. All dampers shall be installed so that damper blades have a full range of movement without interference or binding. Damper quadrant shall be located to provide easy access.
   2. Provide reinforcement to damper as required so that damper remains stable in the airstream without rattling.

C. Turning Vanes:
   1. Turning vanes shall be installed in all mitered elbows with an angle greater than 45 degrees.
   2. The trailing edge of the turning vanes shall be installed tangent to the air stream.
   3. All individual vanes shall be installed on vane rails.

3.05 RECTANGULAR-TO-ROUND TAKE-OFFS

A. Rectangular-to-round take-offs shall be installed in accurately cut openings in the sheet metal duct work.

B. Rectangular-to-round take-offs shall be sealed for the pressure class required.

C. The quadrant damper shall be checked for free movement and left in the full open position after the take-off and insulation is installed. Test and Balance Contractor shall set final damper position.

3.06 INSULATED FLEXIBLE DUCTWORK

A. The length of flexible duct work shall not exceed 5 feet. For lengths of duct required over 5 feet, the remainder shall be galvanized steel round duct.

B. Flex ducts shall be connected in the following manner:
   1. Flex inner duct shall be duct taped, with standard gray tape, first then duct draw band strap applied.
   2. Flex duct insulation shall be butted to connection over flex inner duct. Duct draw band strap shall be applied then taped over with FSK duct tape.

C. Bends in flexible duct shall be made with not less than 1 duct diameter centerline radius. Extend flexible duct beyond end of sheet metal connection before bending.

END OF SECTION

SECTION 23 31 11

ROUND AND FLAT-OVAL SPIRAL DUCTS AND FITTINGS

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.

1.02 DESCRIPTION OF WORK

A. Provide all material fabrication, labor, administration, equipment and services required for complete installation of all galvanized sheet metal ductwork indicated on Drawings and specified herein.

1.03 REFERENCES

A. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE).

B. National Fire Protection Association (NFPA).

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

D. Air Diffusion Council (ADC).

E. Air Movement and Control Association (AMCA).

F. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

A. Submit catalogue data and shop drawings for all materials and equipment listed under this section.

PART 2 PRODUCTS

2.01 CONSTRUCTION

A. Gauge Selection:
   1. Chose gauges for each applicable positive or negative pressure class, as defined for each system in Part 4.0 “Duct Schedules”, per the Eastern Sheet Metal Product Guide (Rev 3 04/09), the SPIDA Round HVAC Duct and Fittings and the SMACNA HVAC Duct Construction Standards
   2. All ducts 6” diameter and larger shall have 2C or 3C corrugations, except; exposed spiral duct, spiral duct fabricated from aluminum or stainless steel, will not be corrugated.
   3. Underground Gauge Selection - PVC coated Duct and fittings shall be constructed of the following gauges and joints:
      3 inch through 8 inch – 26 Ga. Slip Connections
      9 inch through 16 inch – 24 Ga. Slip Connections

18 inch through 24 inch – 22 Ga. Eastern Flange or similar
25 inch through 32 inch - 20 Ga. Eastern Flange or similar
34 inch through 60 inch – 18 Ga. Eastern Flange or similar

4. All ducts larger than 14 inch in diameter shall have underground corrugations added to the spiral duct.

B. Sealing:
1. Spiral seams do not need to be sealed
2. Radial and longitudinal seams for all tees, reducers, elbows and other fittings shall be sealed. Methods may include welding, tack welding and sealing, mechanically closed standing seams, continuous resistance welds, gaskets or other methods unless specifically noted in Paragraph 4.0 Duct Schedules in this Section. Sealing methods should be consistent with maintaining a duct leakage performance of less than class 4, unless specified otherwise in section 4.0 Duct Schedules, at rated pressure.
3. All duct penetrations, including screws, shall be sealed in accordance with ASHRAE Standard 90.1-2010. Rotating shafts shall be sealed with bushings or other devices. Sealing that would void product listings is not required.
4. All transverse joints shall be sealed during installation. Sealing methods should be consistent with maintaining a total system leakage performance of less than class 3, unless specified otherwise in section 4.0 Duct Schedules, at rated pressure. Joints made with gasketed slip connections meeting leakage Class 3 do not require additional sealing when installed in accordance with the manufacturer's instructions.

C. Fittings hall be fabricated to meet the dynamic performance as shown in the ASHRAE Duct Fitting Database (version 5.00.00 - 2008). Typical configurations are as shown in the SPIDA Round HVAC Duct and Fittings and SPIDA Flat Oval HVAC Duct and Fittings and the ESM Product Guide.

D. Sizing:
1. Duct sizes shown are inside clear dimensions. For dual wall duct and for lined single wall ducts, maintain sizes inside lining.
2. Factory-fabricated longitudinal seam duct is acceptable for ducts larger than standard factory spiral sizes.
3. Flat-Oval Duct Sizing – major / minor dimensions chosen for fabrication shall be in accordance with those indicated within the ESM Product Guide and the ESM Spiral Round and Flat Oval Duct Calculator (available at www.easternsheetmetal.com).

E. Fitting Construction:
1. Branch fittings may be provided as full body fittings or as saddles factory mounted on spiral pipe. Branch types shall be as shown on the drawings. Pressed radius entrance branches may be used in lieu of straight and conical branches. Field mounted branches are not acceptable except as noted below.
2. Field mounted saddles will allowed:
   a) When used as a grill box
   b) Downstream of terminal unit leading to a single diffuser
   c) In constant volume systems operating at 1" WG or less
   d) In return duct

F. Dual wall duct fittings shall have spacers to maintain concentricity.

G. Single wall round fittings greater than 36" diameter and all oval fittings with a major axis greater than 36" shall have continuously welded longitudinal and radial seams.

H. The outer pressure shell of dual wall round duct fittings greater than 36” diameter and all dual wall oval duct fittings with a major axis greater than 36” shall have continuously welded longitudinal seams.

I. Transverse Joints:
1. Single wall round joints shall be slip connections through 24” diameter. Self-sealing systems, such as Eastern Tight and Spiro Safe, require no additional sealing. All round joints larger than 24” diameter shall be made with Eastern Flanges or a similar flanging system.
2. Single wall oval joints shall be slip connections through 24” major axis. All joints greater than 24” wide shall be made with Eastern Flanges or a similar flanging system.
3. Dual wall round duct joints shall be concentric slip connections through 12” diameter. Self-sealing systems, such as Eastern Tight and Spiro Safe, require no additional sealing. All round joints larger than 12” diameter shall be made with Eastern Flanges or a similar flanging system. Flanges will be attached to both the inner liner and outer pressure shells keeping the inner liner concentric.
4. Dual wall oval duct joints shall be concentric slip connections through 24” major axis. All joints greater than 24” wide shall be made with Eastern Flanges or a similar flanging system. Flanges will be attached to both the inner liner and outer pressure shells keeping the inner liner concentric.
5. Flanges shall be factory mounted.

J. Duct Cleanliness – Ductwork manufactured under this section shall comply with the “Basic Level” cleanliness requirements defined within the SMACNA “Duct Cleanliness for New Construction Guidelines” (2000). Unless noted elsewhere duct will be delivered from the manufacturer in an enclosed container without additional cleaning or protection from dirt.

K. Duct Reinforcement:
1. Positive Pressure:
a) Round – None Required
b) Oval – Field install reinforcement as needed for applicable pressure class per the ESM Product Guide or the SMACNA HVAC DCS.
2. Negative Pressure
a) Round – Factory mount reinforcement as needed for applicable pressure class per the ESM Product Guide or the SMACNA HVAC DCS.
b) Oval - Factory mount reinforcement as needed for applicable pressure class per the ESM Product Guide or the SMACNA HVAC DCS.

L. Acceptable Manufacturer’s - Subject to compliance with project specific requirements, provide products manufactured by one of the following:
1. Eastern Sheet Metal
2. Prior approval request for substituted manufacturer must be submitted 10 days prior to project bid. Written acceptance from this Office must be provided or substituted manufacturer will not be allowed.

2.02 MATERIALS

A. Sheet Metal:
1. Unless noted otherwise in Paragraph 4.0 Systems Schedules, of this section, or in specific plan notes, round and flat-oval spiral ducts and fittings shall be manufactured from Galvanized Steel, complying with ASTM A653, lock forming quality, G90 minimum.

2. Where noted otherwise, the following metals shall be used:
   a) Galvanneal Steel, Comply with ASTM A875, A60 minimum
   b) Stainless, Comply with ASTM A167; Type 304 or 316 with Finish No. 2B.
   c) Aluminum, Comply with ASTM B289; Alloy 3003, H14 temper will mill finish.
   d) PVC Coated, Galvanized Steel – Comply with ASTM A653
      1) Galvanized coating designation: G60 minimum
      2) Minimum thickness for factory-applied PVC coating:
      3) Underground Applications: minimum 4 mils (0.10 mm) thick on the outer duct surface and 1 mil (0.025 mm) thick on the inner duct surface.
      4) Fume Exhaust Applications: minimum 4 mils (0.10 mm) thick on the inner and 1 mil (0.025 mm) thick on the outer duct surfaces.
      5) Coating materials: Poly-vinyl chloride.
3. Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections, including pitting, dents and other imperfections including those which would impair post painting.
4. Finishes for galvanized surfaces planned to be painted shall be one of the following:
   a) Galvanized steel, ASTM A653, cleaned of grease, oil and dirt then primed prior to applications of a top coat. Cleaning and priming to be performed by painting contractor per the paint manufacturer's recommendation.
   b) Galvanneal Steel, ASTM A875, cleaned of grease, oil and dirt then primed prior to applications of a top coat. Cleaning and priming to be performed by painting contractor per the paint manufacturer's recommendation

B. Metal inner liners for dual wall duct construction:

1. Acoustical dual wall spiral duct; Provide perforated galvanized steel inner liner having 3/32 inch diameter perforations, with overall open area of 23 percent. Inner liner shall be 26 gauge with 3 reinforcement ribs between the seams or 22 gauge smooth. Reinforcement ribs shall be 3/16" and closed. "C" type corrugations are not acceptable.
2. Thermal dual wall spiral duct; Provide galvanized steel solid inner liner Inner liner shall be 26 gauge with 3 reinforcement ribs between the seams or 22 gauge smooth. Reinforcement ribs shall be 3/16" and closed. "C" type corrugations are not acceptable.
3. Unless noted otherwise, the inner wall for dual wall duct fittings shall be 22 gauge solid galvanized steel.

C. Insulation materials:
   1. Dual Wall Duct:
      a) Provide duct with bound fiberglass duct liner insulation, complying with ASTM C1037, NFPA 90A and NFPA 90B. Insulation shall meet or exceed a K value of 0.27.
      b) Flexible closed cell insulation. Provide duct with insulation complying with UL-181 (mold growth / air erosion), NFPA 90A, NFPA 90B and ASTM C 1534. Insulation shall meet or exceed a K value of 0.27.
   2. Alternate Insulation for Single Wall Construction:
      a) High-density fiber glass board. Provide duct with insulation complying with UL-181 (mold growth / air erosion), NFPA 90A and NFPA 90B. Insulation shall meet or exceed a K value of .27.
      b) Acceptable Manufacturers:
         1) Johns Manville Spiracoustic Plus

D. Reinforcement, unless otherwise specified, structural reinforcement will match the duct material.

E. Connectors, unless otherwise specified, connectors will match the duct material.

F. Duct sealers, mastics, gaskets and aerosol sealants must meet the requirements of NFPA 90A for flame spread and smoke developed ratings of 25/50 when tested to UL 723.
   1. Mastics --- shall be applied in accordance with manufacturer specifications.
   2. Rubber gaskets should meet the requirements of ASTM D572 and D573.

G. Fasteners – unless otherwise specified, structural reinforcement will match the duct material. Fasteners for PVC coated duct shall be 304 stainless steel

PART 3 EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to MANUFACTURERS INSTALLATION INSTRUCTIONS.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. All duct penetrations shall be sealed.

F. Install factory fabricated fittings for changes in direction, size and shape and for branch connections.

G. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

H. Install ducts close to walls overhead construction columns and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch, plus allowance for external insulation thickness.

J. Route ducts to avoid passing through electrical equipment rooms and enclosures.

K. Where ducts pass through non-fire rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges (escutcheon plates) of same material thickness as duct. Overlap openings on all sides by at least 1.5 inches.

L. Where ducts pass through fire rated interior partitions and exterior walls, install fire or combination fire/smoke dampers as indicated on drawings.

M. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.02 TRANSVERSE CONNECTIONS

A. All transverse connections must be sealed in accordance with ASHRAE Standard 90.1-2010 unless such sealing will void product warranty.

B. Sealing methods should be consistent with maintaining a total system leakage performance of less than class 4, unless specified otherwise in section 4.0 Duct Schedules.

C. Apply duct sealers, mastics or sealing systems as recommended by the manufacturer. Sealers must not be applied outside the recommended temperature range of the manufacturer.

3.03 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create smooth and uniform bead. Do not use two part tape sealing system.

C. Maintain consistency, symmetry and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories and air outlets.

3.04 PAINTING DUCT

A. Material – Ductwork indicated on the drawings as being post painted shall be manufactured using one of the materials in section 2.2.A.4. above and as indicated within Paragraph 4.0 of this section.

B. Preparation for painting – It shall be the responsibility of the painting contractor to prepare the ductwork for painting, including but not limited to removal of residual manufacturing oils and any other dirt or debris that would preclude proper paint adhesion.

C. Application of a prime coat of paint or etching, brushing or blasting the duct to achieve a paintable profile is at the sole discretion of the painter in accordance with the recommended practice of the paint manufacturer.

3.05 HANGER AND SUPPORT INSTALLATION

A. The upper attachment of suspension systems shall be based upon 1/4 of failure load.

B. Deflection of trapeze or horizontal supports shall not exceed 3/8".

C. Maximum hanger or support spacing shall be 12 feet unless special design methods are employed.

D. Proprietary hanger and support systems shall be used in accordance with manufacturer's installation instructions.

E. Contractor fabricated hanger and support systems shall be in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible (3rd Edition, 2006).

3.06 SEISMIC RESTRAINT DEVICE INSTALLATION (IF APPLICABLE)

A. Install seismic-restraint devices in accordance with the SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems (3rd Edition, 2008).

3.07 INSTALLATION OF BURIED DUCTS (IF APPLICABLE)

A. PVC coated Duct and Fittings – Factory fabricated where indicated on the drawings.

B. Load Specifications
   1. 4 inch through 8 inch – 400 lbs / linear ft.
   2. 9 inch through 12 inch – 600 lbs / linear ft.
   3. 14 inch through 36 inch – 1,800 lbs / linear ft.
   4. Fasteners – All mechanical fasteners to be stainless steel type.

C. Install duct according to manufacturer's instructions.

D. Spot touch-up - When scratches expose bare metal; they should be sealed with PVC tape or PVC Touch-Up paint as recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

A. Duct Cleanliness – Installation of ductwork under this section shall comply with the "Intermediate" requirements defined within the SMACNA "Duct Cleanliness for New Construction Guidelines" (2000). It is the responsibility of the installing contractor to wipe down the interior of the duct prior to installation and to cap all open duct ends once installed.

B. Leakage Tests:
   1. Leakage tests shall be performed on all systems.
   2. Testing methods shall be in accordance with the SMACNA HVAC Duct Leakage Test Manual. The scope of testing will exceed the recommendations of the Manual.
   3. Representative sections totaling no less than 25% of the total installed duct area for the designated pressure class shall be tested. Should any portion fail to achieve the designated leakage rate, an additional 25% percent of the total installed duct area shall be tested. Should any portion of this additional duct fail to achieve the designated leakage rate all duct must be tested.
   4. All sections shall be selected by the building owner or the designated representative of the building owner.
   5. Positive pressure leakage testing is acceptable for negative pressure ductwork.
   6. Any duct failing the pressure test will be resealed and retested, at no extra expense to the owner, until the appropriate leakage rate is achieved.

3.09 DUCT SCHEDULES

A. All Supply Duct Indoors – Constant Volume Or Downstream Of Vav Boxes
   1. Material: Paint Grip Galvanized G90
   2. Pressure Class: 2" WG
   3. Leakage Test Rate: 4
   4. Dual wall
      a) Interstitial Insulation: Mat Faced
      b) Thickness: 1"
      c) Type: Acoustic

B. Supply Duct Indoors – Variable Volume From Ahu To Boxes

1. Material: Paint Grip Galvanized G90
2. Pressure Class: 4" WG
3. Leakage Test Rate: 2
4. Dual wall
   a) Interstitial Insulation: Mat Faced
   b) Thickness: 1"
   c) Type: Acoustic

C. Supply Duct Outdoors
1. Material: Paint Grip Galvanized G90
2. Pressure Class: 4" WG
3. Leakage Test Rate: 2
4. Dual wall
   a) Interstitial Insulation: Mat Faced
   b) Thickness: 2"
   c) Type: Thermal

D. Supply Duct Exposed Indoors
1. Material: Paint Grip Galvanized G90
2. Pressure Class: 2" WG
3. Leakage Test Rate: 2
4. Dual wall
   a) Interstitial Insulation: Mat Faced
   b) Thickness: 1"
   c) Type: Acoustic

E. Supply Duct Exposed Indoors – Pool Area
1. Material: PVC Coated – Color to be selected by the Architect during the submittal phase
2. Pressure Class: 2" WG
3. Leakage Test Rate: 2
4. Dual wall
   a) Interstitial Insulation: Mat Faced
   b) Thickness: 2"
   c) Type: PVC Coated Solid Inner Wall

F. Return Duct Indoors
1. Material: Paint Grip Galvanized G90
2. Pressure Class: -1" WG
3. Leakage Test Rate: 4
4. Dual wall
   a) Interstitial Insulation: Mat Faced
   b) Thickness: 1"
   c) Type: Acoustic

G. Return Duct Exposed Indoors – Pool Area
1. Material: PVC Coated – Color to be selected by the Architect during the submittal phase
2. Pressure Class: -2" WG
3. Leakage Test Rate: 4
4. Dual wall

a) Interstitial Insulation: Mat Faced
b) Thickness: 1”
c) Type: PVC Coated Solid Inner Wall

H. Return Duct Outdoors
1. Material: Paint Grip Galvanized G90
2. Pressure Class: -1” WG
3. Leakage Test Rate: 4
4. Dual wall
a) Interstitial Insulation: Mat Faced
b) Thickness: 1”
c) Type: Thermal

I. Return Duct Exposed Indoors
1. Material: Paint Grip Galvanized G90
2. Pressure Class: 2” WG
3. Leakage Test Rate: 4
4. Single Wall

J. Outside Air Duct
1. Material: Paint Grip Galvanized G90
2. Pressure Class: 2” WG
3. Leakage Test Rate: 4
4. Dual wall
a) Interstitial Insulation: Mat Faced
b) Thickness: 2”
c) Type: Thermal

K. General Exhaust
1. Material: Paint Grip Galvanized G90
2. Pressure Class: -2” WG
3. Leakage Test Rate: 4
4. Single Wall

L. Fume Exhaust
1. Material: Stainless Steel Type 304
2. Pressure Class: -2” WG
3. Leakage Test Rate: 4
4. Single Wall

M. Underground
1. Material: PVC Coated
2. Pressure Class: 2” WG
3. Leakage Test Rate: NA
4. Dual wall
a) Interstitial Insulation: Mat Faced
b) Thickness: 2”
c) Type: Thermal

END OF SECTION

SECTION 23 34 10

CEILING AND CABINET FANS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration, devices, equipment and services required for complete installation of all ceiling and cabinet fans indicated on Drawings and specified in this section.

1.03 REFERENCES

A. Air Diffusion Council (ADC).

B. Air Movement and Control Association (AMCA).

C. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

D. National Fire Protection Association (NFPA).

E. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

F. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

A. Submit catalog data and shop drawings for all materials and equipment listed under the section.

PART 2 PRODUCTS

2.01 CEILING AND CABINET FANS

A. Cabinet Mounted Centrifugal Fans shall be UL listed and bear the AMCA Seal for air and sound performance.

B. Housings shall have an integral backdraft damper, be acoustically insulated, convertible to either horizontal or vertical discharge and equipped with a white powder coated aluminum grille.

C. Fan wheel shall be direct driven, dynamically balanced, forward curved type. Motors shall have internal thermal overload protection, compatible with speed controllers, mounted on vibration isolators and factory wired with quick connect for easy disconnection for inspection and service.

D. Fans shall be equipped with mounting brackets readily adapted to various mountings.

E. The following accessories shall be provided when indicated in the fan schedule:

1. Vibration Isolation.
2. Speed Control mounted to fan.
3. Switch or breaker type lock-out type disconnect.
4. Deluxe aluminum architectural grille.

F. Cook is specified to establish quality of equipment.

2.02 GENERAL

A. Provide and install fans and accessories as scheduled on the Drawings and specified in this Section.

B. Fan air performance ratings shall be in accordance with AMCA Standard 210.

C. Fan sound performance ratings shall be in accordance with AMCA Standard 300 and shall not exceed specified level at specified air delivery conditions.

D. Provide fans capable of accommodating static pressure variations of plus or minus 10 percent.

E. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of the building.

PART 3 EXECUTION

3.01 CEILING AND CABINET FANS

A. Set and install fans as specified and indicated on the drawings and per manufacturer’s requirements.

B. Equipment installation shall be such that filters, motors, bearings can be easily serviced.

C. Provide flexible connectors at inlet and outlet of fans.

D. All fans shall be checked for proper rotation and be lubricated before start up.

END OF SECTION

SECTION 23 36 11

VARIABLE CAPACITY PACKAGED AIR CONDITIONING UNITS WITH GAS

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.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, administration, equipment and services required for complete installation of all variable packaged air conditioning units with gas heat indicated on Drawings and specified herein.

1.03 SYSTEM DESCRIPTION

A. Outdoor rooftop mounted, electrically controlled, heating and cooling unit utilizing fully hermetic digital scroll compressors with on demand crankcase heaters for cooling duty and induced draft gas combustion for heating duty. Supply air shall be discharged downward or horizontally as indicated on the Drawings. Supply air fan system shall be a variable air flow design to deliver a variable quantity and temperature of air to meet the space cooling and heating demand. Controls shall adjust supply air quantity and temperature to adapt to conditioned space load demand. Units shall be of ultra high cooling efficiency and utilize R-410A refrigerant.

1.04 QUALITY ASSURANCE

A. Unit shall well exceed ASHRAE 90.1-2004 and ENERGY STAR efficiency standards.

B. Unit shall be rated in accordance with ARI Standards 210.

C. Units shall be designed in accordance with UL Standard 1995. Unit shall be UL and UL Canada, tested as a total package.

D. Unit shall be rated in accordance with ARI sound standards 270.

E. Unit shall be designed to conform to ASHRAE 15.

F. Roof curb shall be designed to conform to NRCA Standards.

G. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

H. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117.

I. Each unit shall be subjected to a completely automated run testing on the assembly line.

1.05 SUBMITTALS

A. Submit catalog data, shop drawings and installation instructions prior to commencement of work for all materials and equipment incorporated into the drawings and specified under this section.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. General:
1. Unit shall be a fully factory assembled, pre-tested, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-410A), and all special features required prior to field start-up. The damper casing shall be rolled and seam welded 24 gauge galvanized steel duct. One end shall be crimped and the other shall be straight. Damper blades shall be 20 gauge galvanized steel minimum. Round damper blades shall be elliptical with a seal around the entire blade edge. Rectangular dampers shall have fully sealed edges.

B. Unit Cabinet:
1. Constructed of galvanized steel, bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces. Internal surfaces shall be of a primer coated finish.
2. All air stream interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density foil faced cleanable insulation. Insulation shall be bonded with a thermosetting resin and coated with an acrylic or other material that meets the NFPA 90 flame retardance requirements and has an “R” value of 3.70. Insulation shall also be encapsulated with panel design or tape edges ensuring secure fit.
3. Cabinet panels shall be hinged with integrated non-corrosive hinges. Large area hinged access panels for the filter, compressors, evaporator fan, and control box and heat section areas. Each panel shall use multiple quarter-turn latches and handles. Each major external hinged access panel shall be double-wall construction and permanently attached to the rooftop unit. Panels shall also include tiebacks.
4. Return air filters shall be accessible through a dedicated hinged access panel and be on a slide-out track using standard size filters. Filter shall be standard off the shelve sizes and be the size per cabinet. Capability for 2 or 4 inch filters shall be on all sizes.
5. Holes shall be provided in the base rails for rigging shackles and level travel and movement during overhead rigging operations. Base rail thickness shall be minimum 16 gauge.
6. Fork lift slots shall be available from three sides of the unit.
7. Unit shall have a factory--installed internally sloped condensate drain pan, providing a minimum 3/4--in.—14 NPT connection to prevent standing water from accumulating. Pan shall be fabricated of high impact polycarbonate material and shall slide out for cleaning and or maintenance. An alternate vertical drain (3/4--in. NPT) connection shall also be available. All drain pans conform to ASHRAE 62 self—draining provisions.
8. Unit shall have standard thru-the-bottom power and control wiring connection capability.

C. Fans:
1. Indoor blower (evaporator fan):
a. Centrifugal supply air blower shall have rubber isolated, cartridge type ball bearings and adjustable belt drive.
b. Fan wheel shall be made from steel with a corrosion resistant finish. It shall be a

dynamically balanced, double-inlet type with forward-curved blades.

c. The indoor fan system (blower wheels, motors, belts, and both bearings) shall slide out for easy access.
d. Evaporator fan motors shall be continuous operation, open drip--proof. Bearings shall be sealed, permanently lubricated ball bearing type for longer life and lower maintenance.
e. Fan belt shall be located on opposite side of evaporator coil to prevent damage from broken fan belts.
f. Evaporator fan motor Adjustable Speed AC drive – shall follow the provisions of UL 508C, shall have casing material rated for plenum use, shall control the motor from 20% to 100% of the 60Hz speed with input signal derived from the space temperature. AC drive shall have a display for setting drive parameters that can be mounted remote from the AC drive.

2. Condenser fans shall be of the direct-driven propeller type, with corrosion-resistant aluminum blades riveted to corrosion-resistant steel supports. They shall be dynamically balanced and discharge air upwards. Condenser-fan motors shall be totally enclosed, thermally protected, and be of a shaft down design to protect from direct contact from harsh environments.
3. Induced-draft blower shall be of the direct driven, single inlet, forward-curved, centrifugal type. It shall be made from aluminized steel with a corrosion-resistant finish and shall be dynamically balanced.

D. Compressor(s):
1. Fully hermetic, digital scroll type with capacity modulation accomplished by separation of the scroll volutes by pulse width modulation control to provide any capacity between 15 and 100%. Compressor shall have internal high-pressure and temperature protection. Crankcase heaters shall energize on demand.
2. Factory mounted on rubber grommets and internally spring mounted for vibration isolation.
3. Compressor shall be mounted on dedicated mounting plate to ensure secure design and reduced sound levels.
4. Compressor shall be equipped with sound shield to reduce differences in compressor sound between the loaded and unloaded states.

E. Coils:
1. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
2. Condenser and evaporator coils shall be single slab, single pass design to facilitate easy coil cleaning. Composite coils or coils that require unit top panels removed shall be unacceptable.
3. Coils shall be leak tested at 170 psig and pressure tested at 1875 psig.

F. Heating Section:
1. Induced-draft combustion type with energy saving direct-spark ignition system and redundant main gas valve with 2-stage capability on all 3-phase units.
2. Heat Exchanger:
   a. The stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gage type 409 stainless steel, including stainless steel tubes, vestibule plate, and collector box.
3. Burners shall be of the in-shot type constructed of aluminum-coated steel.
4. All gas piping shall enter the unit at a single location. Gas entry shall be capable through side or bottom for unit.

5. All factory-installed orifices are for operation up to 2,000 feet of altitude.
6. The integrated gas controller (IGC) board shall include gas heat operation fault notification using an LED (light-emitting diode).
7. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high-temperature limit switch. Fault indication shall be made using an LED.
8. The IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high-temperature limit switch.
9. The LED shall be visible without removal of control box access panel.
10. Gas burner tray, when disconnected, shall easily slide out for maintenance.

G. Refrigerant Components:
   1. Each refrigerant circuit shall include:
      a. One balanced port thermostatic expansion valve (TXV) with removable power element.
      b. Solid core refrigerant filter driers with pressure ports.
      c. Refrigerant pressure gage ports and connections on suction, discharge, and liquid lines.

H. Filter Section:
   1. Standard filter section shall consist of factory installed 2-in. thick disposable fiberglass filters and shall be on a dedicated slide out track to easily facilitate access and replacement.
   2. Filter section shall use standard size filters and be of common sizes within cabinet sizes.
   3. Optional MERV-8 pleated filters of commercially available sizes shall be provided.
   4. Standard 2-in. filter rack shall be field convertible to 4-in. by removing a spacer.
   5. Compressor Control:
      a. Compressor shall be controlled by a Pulse width modulated control scheme that operates an unloading solenoid valve connected to the digital scroll compressor. The pressure differential across a pressure actuator inside the compressor lifts the upper scroll away from the lower scroll and provides the compressor unloading.

I. Motors:
   1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
   2. Evaporator fan motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection. Evaporator motors are designed specifically for the equipment and do not have conventional horsepower (hp) ratings listed on the motor nameplate. Motors are designed and qualified in the “air-over” location downstream of the cooling coil and carry a maximum continuous bhp rating that is the maximum application bhp rating for the motor; no “safety factors“ above that rating may be applied. Evaporator fan motors shall be designed for use with variable speed AC drive controller.
   3. Totally enclosed condenser-fan motor shall have permanently lubricated, sealed bearings, and inherent automatic-reset thermal overload protection.
   4. Induced-draft motor shall have permanently lubricated sealed bearings and inherent automatic-reset thermal overload protection.

J. Special Features:
   1. Convenience Outlet:
      a. Factory installed powered convenience outlet shall be internally mounted with an

externally accessible 115-v, 2-plug female receptacle with hinged cover. Shall include 15 amp GFI with independent fuse protection and service receptacle disconnect. The convenience outlet is powered from the unit main power wiring through a factory-installed step down transformer. The power wiring for the transformer needs to be field connected per local codes. This may mean wiring before the disconnect switch or after.

2. Non--Fused Disconnect Switch:
   a. Shall be factory-installed, internally mounted, NEC and UL approved. Non-fused switch shall provide unit power shutoff. Shall be accessible from outside the unit and shall provide power off lockout capability.
3. MERV-8 Pleated Return Air Filters:
   a. The filters shall be MERV-8 efficient. The filters shall be 2-in., pleated filters.
4. Hail Guard, Condenser Coil Grille:
   a. Shall protect the condenser coil from hail, flying debris, and damage by large objects without increasing unit clearances.
5. Phase Loss Protection:
   a. Shall provide unit shutdown when an electrical phase loss is detected. Shall be automatic reset type.

K. Daikin DPS025A equipment shall be provided. Equal considerations must be submitted 10 days prior to bid for approval.

2.02 START-UP AND WARRANTY

A. The manufacturer shall provide a factory-trained representative to perform the start-up procedures as outlined in the Start-up, Operation and Maintenance manual provided. Start-up representative will provide all necessary set-up and configuration of the unit controls including communication to the BAS control system to ensure that the unit operates and communicates properly.

B. After the above services have been performed, the same factory-trained representative shall be available for a period of classroom instruction not to exceed 8 hours to instruct the owner's personnel in the proper operation and maintenance of the unit.

C. Standard unit warranty shall include a complete unit parts, labor and refrigerant warranty for a minimum of 5 year after substantial completion. Manufacturer shall coordinate with the Contractor and be aware of the anticipated construction timeframe for the project and provide allowance for warranty. The manufacturer shall provide an original factory warranty certificate for each unit listing model number, serial number and warranty coverage as specified. Warranty labor shall be performed only by manufacturer certified technicians. In addition, manufacturer shall include a 5 year replacement compressor parts warranty and 15 year replacement heat exchanger parts warranty for stainless steel heat exchangers.

PART 3 EXECUTION

3.01 GENERAL

A. Roof mounted package air conditioning units shall be mounted on a factory furnished insulated curb. Top of curb shall be level, flashed and counter-flashed water tight. Contractor shall coordinate with equipment / curb provider to ensure proper slope of curb base. Set unit on curb and provide all final connections as specified herein and indicated on the drawings. Unit and curb shall be secured in compliance to IMC wind loading requirements.

B. Slab mounted packaged air conditioning units shall be set on 8" high concrete base; adhere to manufacturer’s spacing requirements.

END OF SECTION

SECTION 23 85 12

DUCTLESS MINI SPLIT WALL MOUNTED

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Ductless split system wall mounted.

1.02 QUALITY ASSURANCE

A. These units shall be listed by ETL and bear the ETL label.

B. Units shall be rated in accordance to ARI standard 240HP and bear the ARI label.

C. Units shall be manufactured in a facility that has met ISO 9002 and ISO 14001 international standards.

D. A full charge of R-410A for a 25’ line set shall be provided in the condenser section.

E. A dry air holding charge will be provided in the evaporator section.

F. System SEER shall meet or exceed 16 SEER.

1.03 HANDLING AND STORAGE

A. The wireless remote shall be packaged inside the carton with the evaporator section.

B. Wired remote if required shall be shipped as a separate accessory item.

C. Unit shall be handled and stored according to manufacturer's specifications.

PART 2 PRODUCTS

2.01 INDOOR UNIT

A. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuitry and fan motor. The unit shall have a factory installed Plasma/Electrostatic filter to clean return air. The unit shall have self-diagnostic function, 3-minute time delay, an auto restart function, dirty filter indicator, an emergency operation manual run switch. Indoor unit refrigeration piping shall be charged with a dry air holding charge instead of R-410A.

B. Cabinet:
   1. The cabinet shall have a white finish smooth easy to clean surface with and indicator lights to verify functioning and trouble shooting.
   2. Return air shall enter through the top of the cabinet.
   3. There will be a factory supplied separate back plate (if applicable) for securely mounting the evaporator on the wall.

C. Fan:

1. Evaporator fan shall be direct drive DC motor.
2. Fan shall be dynamically balanced and run with permanently lubricated bearings.
3. A motorized air louver (up/down) shall provide automatic changes in air direction to provide a more uniform pattern of air distribution.
4. Indoor fan shall provide 3 (3) speeds, High, Medium, Low.

D. Filter:
1. Factory furnished and installed.

E. Coil:
1. Evaporator shall be nonferrous construction with aluminum plate fins on copper tubing.
2. All tubing shall be factory brazed and leak checked prior to packaging at the factory.

F. Electrical:
1. Power requirement shall be 208/230/1/60.
2. Indoor unit will not have and supplemental electric strip type heat.

G. Control:
1. This unit shall have a wired controller to perform input function necessary for operation of unit.
2. Wired control shall have controls for temperature and time set, master control, air clean, auto swing louver, start/stop, fan and timer, control up to 16 indoor units.
3. Temperature changes shall be from 60^0F – 80^0F in one (1) degree increments.
4. Microprocessor located in the indoor unit shall have the capability to sense return air temperature, coil temperature and process the commands from the remote to operate the outdoor unit as required. Unit shall be capable of automatic restart when power is returned after a power outage.
5. Control signal shall be sent between the indoor unit and outdoor unit on the same wiring delivering voltage to the indoor unit.

2.02 OUTDOOR UNIT

A. The outdoor unit is designed specifically for the matching indoor unit. The unit is equipped with circuit board that interfaces with the indoor unit. Unit is to be factory assembled, wired, piped and run tested prior to leaving the factory.

B. Unit Cabinet:
1. Cabinet will be constructed out of galvanized metal with a baked enamel finish.
2. Fan guard will be louvered to prevent entrance of foreign objects.

C. Fan:
1. Unit will have a direct drive propeller type fan.
2. Motor for fan will be DC voltage permanently lubricated and balanced prior to assembly.
3. Unit will have a horizontal discharge air flow.

D. Coil:
1. Condenser coil shall be nonferrous construction with aluminum plate fin on copper tubing.
2. Refrigerant flow leaving the condenser coil shall be controlled by a metering device.

E. Compressor:
1. Compressor shall be a rotary type or scroll type mounted in such a way to prevent noise and vibration transmission outside the cabinet.
2. Unit will be pre-charged with R410A refrigerant to accommodate a 25’ line set without the addition or removal for Freon.

3. Unit will be capable of a maximum 165’ total line set with a height difference of no more than 65’ without the need to trap, change line sizes or add oil to the system.

F. Electrical:
1. The unit electrical requirement shall be 208/230/1/60.
2. The outdoor unit shall be controlled by a microprocessor.
3. Control voltage to and from the indoor unit shall occur on the same wiring delivering power.

PART 3 EXECUTION

3.01 START-UP AND WARRANTY

A. The manufacturer shall provide a factory-trained representative to perform the start-up procedures as outlined in the Start-up, Operation and Maintenance manual provided. Start-up representative will provide all necessary set-up and configuration of the unit controls including communication to the BAS control system to ensure that the unit operates and communicates properly.

B. After the above services have been performed, the same factory-trained representative shall be available for a period of classroom instruction not less than 2 hours and to exceed 8 hours to instruct the owner's personnel in the proper operation and maintenance of the unit.

C. Standard unit warranty shall include a complete unit parts, labor and refrigerant warranty for a minimum of 1 year after substantial completion. Manufacturer shall coordinate with the Contractor and be aware of the anticipated construction timeframe for the project and provide allowance for warranty. The manufacturer shall provide an original factory warranty certificate for each unit listing model number, serial number and warranty coverage as specified. Warranty labor shall be performed only by manufacturer certified technicians. In addition, manufacturer shall include a 5 year replacement compressor parts.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

PART 2 PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2 Type THHN-2-THWN-2 Type XHHW-2.

C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.02 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Feeders in Cable Tray: Metal-clad cable, Type MC.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

I. Branch Circuits in Cable Tray: Metal-clad cable, Type MC.

J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

G. Complete cable tray systems installation according to Section 26 0536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

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-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.07 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.02 QUALITY ASSURANCE

A. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.02 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
   7. 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.

2.03 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.04 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, sized per drawings.
   1. Bury at least 24 inches (600 mm) below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches (50 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, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. 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.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard

grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

G. Metallic Fences: Comply with requirements of IEEE C2.
   1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
   2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
   3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.04 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
   4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
   5. Substations and Pad-Mounted Equipment: 5 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

   1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. 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.
   2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   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.

PART 3 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 Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted 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.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) 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 (20.7-MPa), 28-day compressive-strength 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.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

PART 2 PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. IMC: Comply with ANSI C80.6 and UL 1242.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Fittings for EMT:
a. Material: Steel.
b. Type: compression.
2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ENT: Comply with NEMA TC 13 and UL 1653.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. Rigid HDPE: Comply with UL 651A.

F. RTRC: Comply with UL 1684A and NEMA TC 14.

G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Fittings for LFNC: Comply with UL 514B.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Hinged type unless otherwise indicated.

D. Finish: Manufacturer's standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Metal Floor Boxes:
   1. Material: Cast metal.
   2. Type: Fully adjustable.
   3. Shape: Rectangular.
   4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

K. Gangable boxes are prohibited.

2.05 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
   1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
   2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Quazite: Hubbell Power System, Inc.
   2. Standard: Comply with SCTE 77.
   3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

2.06 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

PART 3 EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: IMC.
   3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: IMC.
   7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to IMC before rising above floor.

J. Raceways Below Slabs:
1. Change from ENT to IMC before rising above floor.

K. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.

c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.06 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.07 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

PART 2 PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:
1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:
1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [**steel**] [**cast-iron**] pipe 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.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.02 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.03 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.01 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:
1. Black letters on white background.
2. Legend: Indicate voltage and system or service type.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.02 POWER AND CONTROL 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 cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.03 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.

2.04 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.05 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
   1. Comply with ANSI Z535.1 through ANSI Z535.5.
   2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
   3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.06 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs:
   1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
   2. 1/4-inch (6.4-mm) grommets in corners for mounting.
   3. Nominal size, 7 by 10 inches (180 by 250 mm).

C. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

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 (10 mm).

2.08 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   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. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
   4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self-locking.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F ((23 deg C)), According to ASTM D 638: 7000 psi (48.2 MPa).
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
   5. Color: Black.

2.09 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

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 exceeds 16 inches (400 mm) overall.

J. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot (3-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
   1. Emergency Power.
   2. Power.
   3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
      c. Colors for 480/277-V Circuits:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
      d. 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.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Limit use of underground-line warning tape to direct-buried cables.
   2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
   1. Comply with 29 CFR 1910.145.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.

I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) 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.
      d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
   2. Equipment to Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
      b. Enclosures and electrical cabinets.
      c. Access doors and panels for concealed electrical items.
      d. Switchgear.
      e. Switchboards.
      f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
      g. Substations.
      h. Emergency system boxes and enclosures.
      i. Motor-control centers.
      j. Enclosed switches.
      k. Enclosed circuit breakers.

l. Enclosed controllers.
m. Contactors.
n. Battery-inverter units.
o. Power-generating units.
p. Monitoring and control equipment.

END OF SECTION

SECTION 26 05 70

ELECTRICAL SYSTEMS STUDIES (OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT, COORDINATION, AND ARC-FLASH STUDY)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

B. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

C. 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. 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.

B. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

C. SCCR: Short-circuit current rating.

D. 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 may be in digital form.
   1. 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.
   3. Study and equipment evaluation reports.

4. 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.
5. 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 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Provide complete study report for the as built system in both hard copy and electronic format (PDF).
   1. In addition to the report, include the a one-line diagram(s) plotted architectural “C” size or larger, framed, and suitable for mounting in electrical room.

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. 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.

C. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 COMPUTER SOFTWARE

A. Software Developers: Subject to compliance with requirements, provide software by the following:
   1. SKM Systems Analysis, Inc.

B. Comply with IEEE 242, IEEE 399, IEEE 551, IEEE 1584, and NFPA 70E.

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.

E. 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 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. Study Input Data: As described in "Power System Data" Article.

D. 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.

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.

H. 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.

I. 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.

J. Incident Energy and Flash Protection Boundary Calculations:
1. Arcing fault magnitude.
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.

K. 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 26 0553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch (76-by-127-mm) thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 EXECUTION

3.01 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 Architect.
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 equipment that 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.

3.02 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Base study on the device characteristics supplied by device manufacturer.

C. The extent of the electrical power system to be studied is indicated on Drawings.

D. 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.

E. 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.

F. 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.

G. 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 PROTECTIVE DEVICE COORDINATION STUDY

A. 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.

B. 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.

C. 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.

D. 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.

E. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

3.04 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Use the short-circuit study output and the field-verified settings of the overcurrent devices.

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 240-V ac and 208-V ac systems 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.

3.05 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.

3.06 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.07 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.
   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.

3.08 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Time switches.
   2. Photoelectric switches.
   3. Indoor occupancy sensors.
   4. Lighting contactors.
   5. Emergency shunt relays.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.01 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Cooper Industries, Inc.
   2. Intermatic, Inc.
   3. Invensys Controls.
   4. Leviton Mfg. Company Inc.

2.02 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Bryant Electric; a Hubbell company.
   2. Cooper Industries, Inc.
   3. Hubbell Building Automation, Inc.

4. Leviton Mfg. Company Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC; TORK Products.
9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D; a brand of Schneider Electric.
12. Watt Stopper.

C. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:
   a. Sensor: Suitable for mounting in any position on a standard outlet box.
   b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
   c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.03 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Corporation.
4. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.

5. Square D; a brand of Schneider Electric.

C. Description: Electrically operated and mechanically held, combination-type lighting contactors with fusible switch, complying with NEMA ICS 2 and UL 508.
   1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
   2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   3. Enclosure: Comply with NEMA 250.

PART 3 EXECUTION

3.01 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.02 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.03 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.04 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.06 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

END OF SECTION

SECTION 26 22 13

LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
   3. Include diagrams for power, signal, and control wiring.

1.03 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for transformers, accessories, and components, from manufacturer.

B. Source quality-control reports.

C. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Siemens Industry, Inc., Energy Management Division.
   3. GE

2.02 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Transformers shall comply with NEMA Standard TP-1 and be labeled for the EPA Energy Star Program.

C. Comply with NFPA 70.
   1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

D. Transformers Rated 15 kVA and Larger:
   1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
   2. Marked as compliant with DOE 2016 efficiency levels by an NRTL.

E. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

F. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

G. Coils: Continuous windings without splices except for taps.
   1. Coil Material: Copper.
   2. Internal Coil Connections: Brazed or pressure type.
   3. Terminal Connections: Welded.

H. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

2.03 DISTRIBUTION TRANSFORMERS

A. Comply with NFPA 70, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Ventilated.
   1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
   2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
   3. Wiring Compartment: Sized for conduit entry and wiring installation.

E. Enclosure: Ventilated.
   1. NEMA 250, Type 3R: Core and coil shall be encapsulated within resin compound, sealing out moisture and air with drip shield.
   2. Wiring Compartment: Sized for conduit entry and wiring installation.

F. Taps for Transformers 3 kVA and Smaller: One 5 percent tap above normal full capacity.

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

I. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

J. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

K. Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.

L. Wall Brackets: Manufacturer's standard brackets.

2.04 IDENTIFICATION

A. Nameplates: Engraved, laminated-acrylic or melamine plastic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

3.02 INSTALLATION

A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.
   1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

B. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

C. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
   1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Secure transformer to concrete base according to manufacturer's written instructions.

E. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

3.03 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform tests and inspections.

D. Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:
   1. Visual and Mechanical Inspection.
      a. Inspect physical and mechanical condition.
      b. Inspect anchorage, alignment, and grounding.
      c. Verify that resilient mounts are free and that any shipping brackets have been removed.
      d. Verify the unit is clean.
      e. Perform specific inspections and mechanical tests recommended by manufacturer.
      f. Verify that as-left tap connections are as specified.
      g. Verify the presence of surge arresters and that their ratings are as specified.
   2. Electrical Tests:
      a. Measure resistance at each winding, tap, and bolted connection.
      b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: the value of the index shall not be less than 1.0.
      c. Perform turns-ratio tests at all tap positions. Test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If test fails, replace the transformer.
      d. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

E. Remove and replace units that do not pass tests or inspections and retest as specified above.

F. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.05 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

B. SVR: Suppressed voltage rating.

C. TVSS: Transient voltage surge suppressor.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Include wiring diagrams for power, signal, and control wiring.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panelboards for installation according to NECA 407.

1.06 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding [23 deg F (minus 5 deg C)] to plus 104 deg F (plus 40 deg C).
      b. Altitude: Not exceeding 6600 feet (2000 m).

1.07 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: As shown on schedules.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
   2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
   3. Finishes:
      a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
      b. Back Boxes: Same finish as panels and trim.
      c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
   4. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Phase, Neutral, and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Main and Neutral Lugs: Compression type.
   3. Ground Lugs and Bus-Configured Terminators: Compression type.
   4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

D. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.02 PERFORMANCE REQUIREMENTS

2.03 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Branch Overcurrent Protective Devices for Circuit-Breakers: Bolt-on circuit breakers.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

E. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip.

PART 3 EXECUTION

3.01 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install panelboards and accessories according to NECA 407.

B. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

C. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.

D. Install filler plates in unused spaces.

E. Comply with NECA 1.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 0553 "Identification for Electrical Systems."

B. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0570 "Electrical System Study."

3.06 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
2. USB charger devices.
3. GFCI receptacles.
4. Toggle switches.
5. Decorator-style convenience.
6. Wall plates.
7. Floor service outlets.
8. Poke-through assemblies.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 PRODUCTS

2.01 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices for Owner-Furnished Equipment:
1. Receptacles: Match plug configurations.

D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. Controlled Duplex Convenience Receptacles: 125V, 20A: Permanently marked as controlled. Equal to Leviton 5362-S2T (color by architect) comply with NEMA WD 1, NEMA WD 6 configurations 5-20R, UL 498, and FS W-C-596.

2.03 USB CHARGER DEVICES

A. Tamper-Resistant, USB Charger Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.
1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

2. USB Receptacles: Single, Type A.
3. Line Voltage Receptacles: Single, two pole, three wire, and self-grounding.

2.04 GFCI RECEPTACLES

A. General Description:
1. 125 V, 20 A, straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.05 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

2.06 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.07 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.08 POKE-THROUGH ASSEMBLIES

A. Description:
1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
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, four-pair cables.

2.09 FINISHES

A. Device Color:
1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: As selected by Architect.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
   6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
   7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   8. Tighten unused terminal screws on the device.
   9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. 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.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.03 IDENTIFICATION

A. Comply with Section 26 0553 "Identification for Electrical Systems."

3.04 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.

D. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
   1. Cartridge fuses rated 600 V and less for use in switches.

1.03 SUBMITTALS

A. Product Data: For each fuse type indicated.

B. Operation and maintenance data.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA FU 1.

C. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Bussman, Inc.
   2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
   3. Ferraz Shawmut, Inc.
   4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.02 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.02 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Enclosures.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
   2. Altitude: Not exceeding 6600 feet (2010 m).

1.05 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.01 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.02 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.03 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.03 IDENTIFICATION

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.04 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0570 "Electrical System Study."

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior lighting fixtures, lamps, and ballasts.
   2. Emergency lighting units.
   3. Exit signs.
   4. Lighting fixture supports.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Emergency lighting units including battery and charger.
   3. Energy-efficiency data.
   4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
   5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
      a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Installation instructions.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. All Fixtures to have A U.L. label.

1.04 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

2.02 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Factory-Applied Labels: Comply with UL 1598. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.03 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.04 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
   1. Battery: Sealed, maintenance-free, lead-acid type.
   2. Charger: Fully automatic, solid-state type with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.05 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 0529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 EXECUTION

3.01 INSTALLATION

A. Lighting fixtures:
   1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by manufacturer. Verify, with manufacturers, maximum distance between driver and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
   1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
   2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
   3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

E. Suspended Lighting Fixture Support:
   1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
   2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.02 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

3.04 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

3.05 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior luminaires with lamps and ballasts.
   2. Poles and accessories.

1.02 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   2. Details of attaching luminaires and accessories.
   3. Details of installation and construction.
   4. Luminaire materials.
   5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
   6. Ballasts, including energy-efficiency data.
   7. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
   8. Materials, dimensions, and finishes of poles.
   9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
   10. Anchor bolts for poles.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. All fixtures to have U.L. labels.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

2.02 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

K. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

L. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
   2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      a. Color: As selected by Architect from manufacturer's full range.

M. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USES ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.

c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

2.03 FLUORESCENT BALLASTS AND LAMPS

A. Ballasts for Low-Temperature Environments:
1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.

B. Ballast Characteristics:

1. Power Factor: 90 percent, minimum.
2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Electromagnetic Ballasts: Comply with ANSI C82.1, energy-saving, high power factor, Class P, automatic-reset thermal protection.
4. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
5. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

C. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures 0 deg F (minus 18 deg C) and higher.

2.04 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.
1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange.

2.05 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 40 feet (12 m) in height with access handhole in pole wall.

1. Shape: as indicated on schedules.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Brackets for Luminaires: Detachable, cantilever, without underbrace.
1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with stainless-steel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
3. Match pole material and finish.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Steps: Fixed steel, with nonslip treads, positioned for 15-inch (381-mm) vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet (3 m) above finished grade.

E. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 26 0526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

F. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

G. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
a. Color: As selected by Architect from manufacturer's full range.

2.06 DECORATIVE POLES

A. Pole Material:

1. Cast concrete or spun concrete.

B. Mounting Provisions:
1. Embedded.

C. Fixture Brackets:
1. Cast ductile iron.

D. Pole Finish: as selected by architect.

2.07 PRESTRESSED CONCRETE POLES

A. Poles: Manufactured by centrifugal spin-casting process.
1. Shape: as selected by architect.
2. Mounting Provisions: Embedded.
3. Finishing: Capped at top and plugged at bottom. Seat each steel reinforcing strand with epoxy adhesive.

4. Grounding: Continuous copper ground wire cast into pole. Terminate at top of pole and attach to 24-inch (610-mm) lightning rod.

B. Cure with wet steam and age for a minimum of 15 days before installation.

C. Fabricate poles with a hard, nonporous surface that is resistant to water, frost, and road and soil chemicals and that has a maximum water-absorption rate of 3 percent.

D. Cast aluminum nameplate into pole wall at approximately 5 feet (1.5 m) above ground line, listing name of manufacturer, Project identifier, overall height, and approximate weight.

E. Pole Brackets: Comply with ANSI C136.13.

F. Finish Color: Provided by color material complying with ASTM C 979, uniformly impregnated throughout the pole concrete. Color material shall provide a uniform, stable, permanent color and be as follows:
1. Inert, and carbon free.
2. Unaffected by environmental conditions and contaminants including, but not limited to, UV solar radiation, salts, and alkalis.

G. Finish Texture: as selected by architect.

PART 3 EXECUTION

3.01 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

C. Adjust luminaires that require field adjustment or aiming.

3.02 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
1. Fire Hydrants and Storm Drainage Piping: 60 inches (1520 mm).
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet (3 m).
3. Trees: 15 feet (5 m) from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.
1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
2. Install base covers unless otherwise indicated.
3. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
1. Dig holes large enough to permit use of tampers in the full depth of hole.
2. Backfill in 6-inch (150-mm) layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Raise and set poles using web fabric slings (not chain or cable).

3.03 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.

3.04 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth.

3.05 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.06 GROUNDING

A. Ground metal poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole unless otherwise indicated.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole.
   2. Install grounding conductor and conductor protector.
   3. Ground metallic components of pole accessories and foundations.

3.07 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
   1. Verify operation of photoelectric controls.

END OF SECTION

SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Metallic surface pathways.
7. Nonmetallic surface pathways.
8. Hooks.
9. Boxes, enclosures, and cabinets.
10. Polymer-concrete handholes and boxes for exterior underground cabling.

PART 2 PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Description: Metal raceway of circular cross section with manufacturer-fabricated fittings.

B. General Requirements for Metal Conduits and Fittings:
1. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
2. Comply with TIA-569-D.

C. EMT: Comply with ANSI C80.3 and UL 797.

D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
2. Fittings for EMT:
a. Material: Steel.
b. Type: Setscrew.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Description: Nonmetallic raceway of circular section with manufacturer-fabricated fittings.

B. General Requirements for Nonmetallic Conduits and Fittings:
1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
2. Comply with TIA-569-D.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651A.

F. RTRC: Comply with UL 2515A and NEMA TC 14.
   1. Fittings: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal trough of rectangular cross section fabricated to required size and shape, without holes or knockouts, and with hinged or removable covers.

B. General Requirements for Metal Wireways and Auxiliary Gutters:
   1. Comply with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
   2. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
   3. Comply with TIA-569-D.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

C. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:
   1. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
   2. Comply with TIA-569-D.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.05 SURFACE METAL PATHWAYS

A. Description: Galvanized steel with snap-on covers, complying with UL 5.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

2.06 SURFACE NONMETALLIC PATHWAYS:

A. Description: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC.

B. Finish: Texture and color selected by Architect from manufacturer's standard colors.

C. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with TIA-569-D.

2.07 HOOKS

A. Description: Prefabricated sheet metal cable supports for telecommunications cable.

B. Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with TIA-569-D.

D. Galvanized or stainless steel.

E. J shape.

2.08 BOXES, ENCLOSURES, AND CABINETS

A. Description: Enclosures for communications.

B. General Requirements for Boxes, Enclosures, and Cabinets:
1. Comply with TIA-569-D.
2. Boxes, enclosures, and cabinets installed in wet locations shall be listed and labeled as defined in NFPA 70, by an NRTL, and marked for use in wet locations.
3. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
4. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
5. Gangable boxes are allowed.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:
   a. Material: Plastic.
   b. Finished inside with radio-frequency-resistant paint.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:
1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 EXECUTION

3.01 PATHWAY APPLICATION

A. Minimum Pathway Size: 3/4-inch (21-mm) trade size for copper and aluminum cables, and 1 inch (25 mm) for optical-fiber cables.

B. Pathway Fittings: Compatible with pathways and suitable for use and location.

C. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

D. Install surface pathways only where indicated on Drawings.

E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 INSTALLATION

A. Comply with the following standards for installation requirements except where requirements on Drawings or in this Section are stricter:
1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

C. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

D. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems" for hangers and supports.

E. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

F. Complete pathway installation before starting conductor installation.

G. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

H. Conceal rigid conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches (300 mm) of enclosures to which attached.

J. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings. Comply with requirements for expansion joints specified in this article.
3. Arrange pathways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from nonmetallic conduit and fittings to GRC or IMC and fittings before rising above floor.

K. Stub-ups to Above Recessed Ceilings:
1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure, to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits of 2-inch (50-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

P. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Secure pull wire, so it cannot fall into conduit. Cap pathways designated as spare alongside pathways in use.

Q. Surface Pathways:
1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

S. Install pathway-sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a

blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway-sealing fittings according to NFPA 70.

T. Install devices to seal pathway interiors at accessible locations. Locate seals, so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service pathway enters a building or structure.
   3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

V. Expansion-Joint Fittings:
   1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC [**and EMT**] that is located where environmental temperature change may exceed 100 deg F (55 deg C), and that has straight-run length that exceeds 100 feet (30 m).
   2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
   3. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
   4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Hooks:
   1. Size to allow a minimum of 25 percent future capacity without exceeding design capacity limits.
   2. Shall be supported by dedicated support wires. Do not use ceiling grid support wire or support rods.
   3. Hook spacing shall allow no more than 6 inches (150 mm) of slack. The lowest point of the cables shall be no less than 6 inches (150 mm) adjacent to ceilings, mechanical ductwork and fittings, luminaires, power conduits, power and telecommunications outlets, and other electrical and communications equipment.
   4. Space hooks no more than 5 feet (1.5 m) o.c.
   5. Provide a hook at each change in direction.

X. Mount boxes at heights indicated on Drawings. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

CC. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Install backfill.
   2. After installing conduit, backfill and compact.
   3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete around conduit for a minimum of 12 inches (300 mm) on each side of the coupling.
      b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
   4. Underground Warning Tape: Comply with requirements in Section 270553 "Identification for Communications Systems."

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.06 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.07 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 05 29

HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Steel slotted support systems for communication raceways.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

PART 2 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles, with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Galvanized steel.
3. Channel Width: 1-5/8 inches (41 mm).
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel and malleable-iron clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. 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.
2. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.02 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 Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 EXECUTION

3.01 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-C.
4. NECA 101
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with 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 (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.02 SUPPORT INSTALLATION

A. 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 (90 kg).

B. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications 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: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use 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 (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
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.

C. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION

SECTION 27 15 13

COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Category 6 twisted pair cable.
   2. Category 6a twisted pair cable.
   3. Twisted pair cable hardware, including plugs and jacks.
   4. Cable management system.
   5. Grounding provisions for twisted pair cable.

1.02 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
   1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
   2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
   3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m) and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.
   1. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment.

C. Twisted pair cable testing plan.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For RCDD, Installer, installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
   1. Layout Responsibility: Preparation of Shop Drawings and cabling administration Drawings by an RCDD.
   2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
   3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.07 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.02 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
   1. Communications Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway or Type CMP in listed cable routing assembly.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

C. RoHS compliant.

2.03 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Unshielded twisted pairs (UTP).

E. Cable Rating: Plenum.

F. Jacket: Blue thermoplastic.

2.04 CATEGORY 6a TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz.

B. Standard: Comply with TIA-568-C.2 for Category 6a cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Unshielded twisted pairs (UTP).

E. Cable Rating: Plenum.

F. Jacket: Blue thermoplastic.

2.05 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Leviton Manufacturing Co., Inc.
2. Or approved equal.

C. General Requirements for Twisted Pair Cable Hardware:
1. Comply with the performance requirements of Category 6 Category 6a.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Source Limitations: Obtain twisted pair cable hardware from same manufacturer as twisted pair cable, from single source.

E. Connecting Blocks:
1. 110-style IDC for Category 6.
2. 110-style IDC for Category 6a.
3. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
1. Features:
a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.
2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

H. Patch Cords: Factory-made, four-pair cables in 48-inch (1200-mm) lengths; terminated with an eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.

I. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

J. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.

2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

K. Faceplate:
1. Two port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:
1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.06 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

PART 3 EXECUTION

3.01 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
1. Install plenum cable in environmental air spaces, including plenum ceilings.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

D. General Requirements for Cabling:
1. Comply with TIA-568-C.1.
2. Comply with BICSI's Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI information

Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.

9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:
1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.

3.02 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.03 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.04 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration.

C. Equipment grounding conductors.

D. Cable and Wire Identification:
1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
   a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
   b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
   1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
   2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
   3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

SECTION 28 4621.11

ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Provide a complete and coordinated Class B wiring, fire alarm system in accordance with the contract documents. Audible intelligibility shall be provided throughout the building.

B. Contractor shall adjust candela, dB or other setting of fire alarm devices as required accommodating product changes. As a minimum, an additional 10 audio/visual alarms, 5 smoke detectors, and 50 addressable interface devices shall be included in the price including labor.

C. Section Includes:
1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Device guards.
7. Firefighters' smoke-control station.
8. Magnetic door holders.
9. Remote annunciator.
10. Addressable interface device.
11. Digital alarm communicator transmitter.
12. Radio alarm transmitter.
13. Network communications.
14. System printer.
15. Retain subparagraph below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

1.03 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.
1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.
   1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   2. Include plans, elevations, sections, details, and attachments to other work.
   3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
   4. Detail assembly and support requirements.
   5. Include voltage drop calculations for notification-appliance circuits.
   6. Include battery-size calculations.
   7. Include input/output matrix.
   8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
   9. Include performance parameters and installation details for each detector.
   10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
   12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
      a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
      b. Show field wiring required for HVAC unit shutdown on alarm.
      c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
      d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
      e. Locate detectors according to manufacturer's written recommendations.
      f. Show air-sampling detector pipe routing.
   13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
   14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:
   1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
   2. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire-alarm system design.
      b. NICET-certified, fire-alarm technician; Level IV minimum.
      c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
   2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
   3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.06 Sample Warranty: For special warranty.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components 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. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
      b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
      d. Riser diagram.
      e. Device addresses.
      f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
      g. Record copy of site-specific software.
      h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
         1) Equipment tested.
         2) Frequency of testing of installed components.
         3) Frequency of inspection of installed components.
         4) Requirements and recommendations related to results of maintenance.
         5) Manufacturer's user training manuals.
      i. Manufacturer's required maintenance related to system warranty requirements.
      j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.08 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps for Remote Indicating Lamp Units: Quantity equal to [**10**] percent of amount installed, but no fewer than one unit.
   2. Lamps for Strobe Units: Quantity equal to [**10**] percent of amount installed, but no fewer than one unit.
   3. Smoke Detectors, Fire Detectors: Quantity equal to [**10**] percent of amount of each type installed, but no fewer than one unit of each type.
   4. Detector Bases: Quantity equal to [**two**] percent of amount of each type installed, but no fewer than one unit of each type.
   5. Keys and Tools: One extra set for access to locked or tamper proofed components.

6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
8. Filters for Air-Sampling Detectors: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.

1.09 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer shall be licensed by the Alabama State Fire Marshal's Office in accordance with Alabama Act 2009-657.

C. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

E. Codes and Standards:
1. National Fire Protection Association (NFPA): NFPA 70, 2017; NFPA 72; NFPA 101NFPA 241; NFPA 101.
2. International Building Code
3. International Fire Code
4. Local and City Codes including Amendments
5. Americans with Disabilities Act
6. Underwriters Laboratories (UL)

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performing all operations in connection with the installation of the multiplex addressable Fire Alarm System (Calls B) as shown on the drawings, as hereinafter specified, and as directed by the architect/engineer.

B. The Fire Alarm System shall consist of all necessary hardware and software equipment to perform the following functions:
a. Fire Alarm and Detection Operations
b. Two-way Supervised Voice Communications Operations
c. One-way Supervised Automatic Voice Alarm Operations
d. Remote Manual and Automatic Control of elevators, all Smoke Control Related Fan Systems, remote monitoring of sprinkler, fire pump and emergency power systems.
e. Interface to Division 23 Smoke Control equipment with appropriate outputs, control, and graphics.

C. Each item of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by the Underwriters Laboratories, Inc. (UL), and

shall bear the “UL” label. The Control Equipment for all Systems shall be listed under UL category UOJZ as a Singe Control Unit.

D. The complete installation shall conform to the applicable sections of NFPA 72, NEC 760, Life Safety Code 101, and Local Authorities Having Jurisdiction.

E. Nodes as defined for this specification shall be intelligent, microprocessor-based devices that connect to and handle network communications.

F. By programmable selection at each node:
   a. The specific detail information of any point connected to any node in the network may be made accessible to the network.
   b. Points within each node shall be able to be grouped by area, type of device, type of function, or any other user selectable category, and custom labeled as a point list. A point list shall be acted upon as though it was a point for purposes of interaction with the node custom control program. Detail information shall not burden the point list messages, only the quantity and type of status shall be broadcast into the network.

G. The fire alarm system shall be provided with the primary monitoring host computer system for alarm, trouble, and supervisory indication located as shown on the system. The host system shall be connected to the fire alarm control panels utilizing an RS-485, or equivalent network protocol on a twisted pair communication bus network.

H. Automatic sensitivity control of certain smoke detectors.

I. All components provided shall be listed for use with the selected system.

J. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

K. Provide TVSS on incoming power and communications circuits.

2.02 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:
   1. Manual stations.
   2. Heat detectors.
   3. Smoke detectors.
   4. Duct smoke detectors.

B. Fire-alarm signal shall initiate the following actions:
   1. Continuously operate alarm notification appliances, including voice evacuation notices.
   2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
   3. Transmit an alarm signal to the remote alarm receiving station.
   4. Unlock electric door locks in designated egress paths.
   5. Release fire and smoke doors held open by magnetic door holders.
   6. Activate voice/alarm communication system.
   7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
   8. Activate emergency lighting control.
   9. Activate emergency shutoffs for gas and fuel supplies.
   10. Record events in the system memory.
   11. Record events by the system printer.
   12. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
   1. Valve supervisory switch.

2. Alert and Action signals of air-sampling detector system.
3. Independent fire-detection and -suppression systems.
4. User disabling of zones or individual devices.
5. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.
11. Hose cabinet door open.

E. System Supervisory Signal Actions:
1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.03 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Notifier/Honeywell
2. Siemens
3. Other systems by preapproval.

B. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability Level 1 unless otherwise required by code.
3. When wiring connecting the FSCS to any remote-mounted controlling device exceeds 100 feet, the wire shall be 2-hour rated in addition to being in conduit.
4. Install no more than 100 addressable devices on each signaling-line circuit.

E. Smoke-Alarm Verification:
1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

F. Notification-Appliance Circuit:
1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

G. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center.
1. Provide multi-channel digital system and indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.

a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
b. Programmable tone and message sequence selection.
c. Standard digitally recorded messages for "Evacuation" and "All Clear."
d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.

2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

J. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also, print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

L. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
1. Batteries: Sealed lead calcium.

M. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

N. Fire Alarm Control Unit shall include a cabinet for housing record documentation per NFPA 72.

2.04 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.05 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
    a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
    b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
    c. Multiple levels of detection sensitivity for each sensor.
    d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.06 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.
1. Mounting: Adapter plate for outlet box mounting.
2. Testable by introducing test carbon monoxide into the sensing cell.
3. Detector shall provide alarm contacts and trouble contacts.

4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Comply with UL 2075.
6. Locate, mount, and wire according to manufacturer's written instructions.
7. Provide means for addressable connection to fire-alarm system.
8. Test button simulates an alarm condition.

2.07 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.
   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.
   1. Mounting: Adapter plate for outlet box mounting.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).
   1. Mounting: Adapter plate for outlet box mounting.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.08 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.

B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

D. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
   1. Rated Light Output:
      a. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.
   6. Mounting Faceplate: Factory finished, white.

E. Voice/Tone Notification Appliances:
   1. Comply with UL 1480.

2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: Flush.
6. Matching Transformers: Tap range matched to acoustical environment of speaker location.

F. Exit Marking Audible Notification Appliance:
1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
2. Provide exit marking audible notification appliances at the entrance to all building exits.
3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.10 FIREFIGHTERS' SMOKE-CONTROL SYSTEM

A. Initiate Smoke-Management Sequence of Operation:
1. Comply with sequence of operation as described in Section 230993.11 "Sequence of Operations for HVAC DDC."
2. Fire-alarm system shall provide all interfaces and control points required to properly activate smoke-management systems.
3. First fire-alarm system initiating device to go into alarm condition shall activate the smoke-control functions.
4. Subsequent devices going into alarm condition shall have no effect on the smoke-control mode.

B. Addressable Relay Modules:
1. Provide address-setting means on the module. Store an internal identifying code for control panel use to identify the module type.
2. Allow the control panel to switch the relay contacts on command.
3. Have a minimum of two normally open and two normally closed contacts available for field wiring.
4. Listed for controlling HVAC fan motor controllers.

2.11 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
1. Electromagnets: Require no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.12 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, including acknowledging, silencing, resetting, and testing.
1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.13 ADDRESSABLE INTERFACE DEVICE

A. General:
   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.
   1. Allow the control panel to switch the relay contacts on command.
   2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:
   1. Operate notification devices.
   2. Operate solenoids for use in sprinkler service.

2.14 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:
   1. Verification that both telephone lines are available.
   2. Programming device.
   3. LED display.
   4. Manual test report function and manual transmission clear indication.
   5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:
   1. Address of the alarm-initiating device.
   2. Address of the supervisory signal.
   3. Address of the trouble-initiating device.
   4. Loss of ac supply.
   5. Loss of power.
   6. Low battery.
   7. Abnormal test signal.
   8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.15 NETWORK COMMUNICATIONS

A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.

B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.

C. Provide integration gateway for connection to building automation system, coordinate with UAB Facilities.

2.16 SYSTEM PRINTER

A. Printer shall be listed and labeled as an integral part of fire-alarm system.

2.17 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
   1. Factory fabricated and furnished by device manufacturer.
   2. Finish: Paint of color to match the protected device.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
   1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
   1. Devices placed in service before all other trades have completed cleanup shall be replaced.
   2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Equipment Mounting: Install fire-alarm control unit on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
   1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (460-mm) centers around the full perimeter of concrete base.
   2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

D. Manual Fire-Alarm Boxes:
   1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
   2. Mount manual fire-alarm box on a background of a contrasting color.
   3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing:
   1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
   2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
   3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
   4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex Ain NFPA 72.
   5. HVAC: Locate detectors not closer than 36 inches (910 mm) from air-supply diffuser or return-air opening.
   6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

F. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.
   1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

H. Air-Sampling Smoke Detectors: If using multiple pipe runs, the runs shall be pneumatically balanced.

I. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

J. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

K. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

L. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

M. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.

N. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.03 PATHWAYS

A. Pathways shall be installed in EMT.

B. Exposed EMT shall be painted red enamel.

3.04 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
   2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
   3. Smoke dampers in air ducts of designated HVAC duct systems.
   4. Magnetically held-open doors.
   5. Electronically locked doors and access gates.
   6. Alarm-initiating connection to elevator recall system and components.
   7. Alarm-initiating connection to activate emergency lighting control.
   8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
   9. Supervisory connections at valve supervisory switches.
   10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
   11. Supervisory connections at elevator shunt-trip breaker.
   12. Data communication circuits for connection to building management system.
   13. Data communication circuits for connection to mass notification system.
   14. Supervisory connections at fire-extinguisher locations.
   15. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
   16. Supervisory connections at fire-pump engine control panel.

3.05 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

C. Paint all fire alarm junction boxes red.

3.06 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.07 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect, authorities having jurisdiction, and Owner.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.08 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   4. Test system one year after date of substantial completion, comply with NFPA 72. Use NFPA forms developed for initial test and inspections.

3.09 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

ALL EARTHWORK WITHIN MADISON COUNTY RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH MADISON COUNTY SPECIFICATIONS. ALL OTHER EARTHWORK SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches within building lines.
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Civil Site Sections include the following:

1. Section 311000 "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
2. Section 321200 "Hot Mix Asphalt Paving" for granular course.

1.3 MASS ROCK

A. Mass rock excavation, including replacement with approved materials is to be included in the General Contractors contract. Rip Rock is to be included in General Contractor’s contract.

1.4 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill an excavated area to final grade.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill as approved by geotechnical engineers.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as recommended by Owner's Testing Agency, and approved by the Owner, to reach specified compaction level. Additional excavation and replacement material costs are to be included in the Base Contract amount.
Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.

2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Owner's Testing Agency. Unauthorized excavation, as well as remedial work recommended by Owner's Testing Agency, shall be without additional compensation.

G. Fill: Suitable soil materials, as determined by the Owner's Testing Agency, used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator equal to Caterpillar Model No. 215D-LC; equipped with a 42-inch- wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbf and stick-crowd force of not less than 18,000 lbf; measured according to SAE J-1179.

2. Bulk or Open Excavation: Late-model, track-type tractor, equal to Caterpillar Model No. D-8N, rated at not less than 285-hp flywheel and equipped with a single-shank hydraulic ripper, capable of exerting not less than 45,000-lbf breakout force; measured according to SAE J-732.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.

2. Drainage fabric.

3. Separation fabric.

B. Samples: For the following:

1. 30-lb samples sealed in airtight containers, of each proposed soil material from on-site or borrow sources.

2. 12-by-12-inch sample of drainage fabric.

3. 12-by-12-inch sample of separation fabric.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

3. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

B. Pre-excavation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's written permission.

3. Contact utility-locator service for area where Project is located before excavating.

4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

B. Geotechnical Report: A subsurface geotechnical investigation report for the site, prepared by Geo Solutions, L.L.C. dated September 11, 2018 is available for information only. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of the subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. The Owner, nor the Architect, will not be responsible for interpretations or conclusions drawn from this data by the Contractor. The Contractor shall make their own investigation of existing subsurface conditions. The Owner, nor the Architect, will be responsible in any manner for additional compensation for excavation work performed under the Contract due to the Contractor's assumptions based on soil investigation data prepared by the Owner's geotechnical investigation.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. CL can be used if approved by geotechnical engineer.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, MH, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.

2. Yellow: Gas, oil, steam, and dangerous materials.

3. Orange: Telephone and other communications.

4. Blue: Water systems.

5. Green: Sewer systems.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf; ASTM D 4632.

2. Tear Strength: 40 lbf; ASTM D 4533.

3. Puncture Resistance: 50 lbf; ASTM D 4833.

4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.

5. Apparent Opening Size: No. 50; ASTM D 4751.

C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf; ASTM D 4632.

2. Tear Strength: 75 lbf; ASTM D 4533.

3. Puncture Resistance: 90 lbf; ASTM D 4833.

4. Water Flow Rate: 4 gpm per sq. ft.; ASTM D 4491.

5. Apparent Opening Size: No. 30; ASTM D 4751.

D. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

E. Erosion-Control Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 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. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Unsuitable soils as a result of improper dewatering are to be removed and replaced at the General Contractor’s expense.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation. Unsuitable soils as a result of improper subgrade protection are to be removed and replaced at the General Contractor’s expense.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: The use of explosives is prohibited.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to, and beyond, subgrade elevations as necessary to reach specified compaction level, regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions. Unclassified excavated material may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for excavation or removal of material.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials as directed by the Owner's Testing Agency. Replacement of soils shall be included in both the Contract Time and Contract Sum. No adjustments shall be authorized to either component for such occurrences.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths, in accordance with OSHA guidelines, to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. See Plans for trenching details.

3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

A. Notify Owner's Testing Agency when excavations have reached required subgrade.

B. If Owner's Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material is included in the General Contractor's Contract Sum.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Testing Agency.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under sidewalks and curbs by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for record documents.

3. Inspecting and testing underground utilities.

4. Removing concrete formwork.

5. Removing trash and debris.

6. Removing temporary shoring and bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use satisfactory soil material.

3. Under steps and ramps, use engineered fill.

4. Under building slabs, use engineered fill.

5. Under footings and foundations, use engineered fill.

3.14 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698.

1. Under structures, building slabs, steps and pavements, the compaction should be a minimum of 95 percent of the optimum density.

D. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.

2. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.

3.16 GRADING

A. General: 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.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus, or minus 1 inch.

2. Walks: Plus or minus 1/2 inch.

3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.

2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

3. Shape subbase and base to required crown elevations and cross-slope grades.

4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.

5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 60 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by the Owner’s Testing Agency.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 5000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

D. Protect areas with slopes exceeding 1 vertical: 2 horizontal with erosion-control fiber mesh and with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect areas with slopes not exceeding 1 vertical: 2 horizontal by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

ALL SITE CLEARING WITHIN MADISON COUNTY RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH MADISON COUNTY SPECIFICATIONS. ALL OTHER SITE CLEARING SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing.
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:

1. Section 310000 "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Contractor's record drawings shall not be required for this project.

1.6 QUALITY ASSURANCE

A. Preconstruction Conference: Attend pre-construction conference at Project site prior to initiating construction.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Confirm that the Owner has authority for performing work on property adjoining Owner's property prior to proceeding with this Work.

C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 310000 "Earthwork."

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.

2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

3. Maintain existing drainage pattern in all tree save areas – standing water in these areas is not permitted.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.

2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

A. Arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange to shut off indicated utilities with utility companies.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's and Engineer's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

4. Use only hand methods for grubbing within drip line of remaining trees.

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

1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer in accordance with requirements for structural fill.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches.

2. Do not stockpile topsoil within drip line of remaining trees.

3. Dispose of excess topsoil as specified for waste material disposal.

4. Stockpile surplus topsoil and allow for respreading topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

B. Storage or sale of cleared items or materials on-site is not permitted.

END OF SECTION

SECTION 31 31 16

TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 PRICE AND PAYMENT PROCEDURES

A. Soil Treatment: By the square yard of treated soil. Includes applying toxicant to designated soil, re-treating when directed , warranty , annual inspections.

1.03 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Application Instructions: Indicate caution requirements .

E. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

F. Provide written warranty agreeing to re-treat soil and repair damage caused by termite infestation, carpenter ants and other pests during five (5) year period from date of substantial completion.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work.
   1. Licensed in Alabama.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MATERIALS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION

A. Spray apply toxicant in accordance with manufacturer's instructions.

B. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. At Both Sides of Foundation Surface.

C. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

D. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

E. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

F. Re-treat disturbed treated soil with same toxicant as original treatment.

G. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 32 12 00

HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

ALL ASPHALT PAVEMENT WITHIN MADISON COUNTY RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH MADISON COUNTY SPECIFICATIONS. ALL OTHER ASPHALT PAVEMENT SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

1.2 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.
3. Pavement-marking paint.
4. Wheel stops.

B. Related Sections include the following:

1. Section 310000 "Earthwork" for aggregate subbase and base courses and aggregate pavement shoulders.
2. Section 321373 "Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.

1. Standard Specification: Alabama Department of Transportation Standard Specifications' for Highway Construction, latest edition
2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Job-Mix Designs: For each job mix proposed for the Work.

D. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

E. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the Alabama Department of Transportation.

C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.

D. Asphalt-Paving Publication: Comply with “ALDOT Standard Specifications for Highway Construction,” latest edition, except where more stringent requirements are indicated.

E. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to asphalt paving including, but not limited to, the following:

1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

2. Review condition of substrate and preparatory work performed by other trades.

3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.

5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.

6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.

2. Slurry Coat: Comply with weather limitations of ASTM D 3910.

3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.

4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag; complying with ASTM D 692.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag, or combinations thereof; complying with ASTM D 1073.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

C. Undersealing Asphalt: ASTM D 3141, pumping consistency.

D. Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC-250.

E. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.

F. Prime Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

G. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

H. Fog Seal: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

I. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: Nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

2. Base Course: As indicated on drawings

3. Binder Course: As indicated on drawings

4. Surface Course: As indicated on drawings.

B. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

2. Provide mixes complying with the composition, grading, and tolerance requirements of ASTM D 3515 for the following nominal, maximum aggregate sizes:

   a. Base Course: As indicated on drawings.

   b. Surface Course: As indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, equipment having a minimum loaded weight of 25 tons to locate areas that are unstable or that require further compaction.

C. Notify Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 COLD MILLING

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.

1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.

2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.

2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.

1. Allow tack coat to cure undisturbed before paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.

2. Protect primed substrate from damage until ready to receive paving.

3.5 GEOTEXTILE INSTALLATION

A. Apply bond coat, consisting of asphalt cement, uniformly to existing surfaces at a rate of 0.20 to 0.30 gal./sq. yd..

B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.

1. Protect paving geotextile from traffic and other damage and place overlay paving the same day.

3.6 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated. Place hot-mix asphalt surface course in single lift.

2. Spread mix at minimum temperature of 250 deg F.

3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.

4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

5. Place asphalt in direction of traffic flow.

B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat.

2. Offset longitudinal joints in successive courses a minimum of 6 inches.

3. Offset transverse joints in successive courses a minimum of 24 inches.

4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."

5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.

6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.

2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.

2. Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.

2. Surface Course: 1/8 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint in two separate coats, with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide an overall minimum wet film thickness of 15 mils.

3.11 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than 2 galvanized steel dowels embedded in precast concrete at one-third points. Firmly bond each dowel to wheel stop and to pavement.

1. Extend upper portion of dowel 5 inches into wheel stop and lower portion a minimum of 5 inches into pavement or as noted on the detail, which ever is greater.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.

1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.

2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

3. A test strip will be established in general accordance with local DOT practice to assist the contractor establish an optimum rolling pattern for compacting the hot mix asphalt. This procedure should include at a minimum:

    a. Selecting multiple fixed test locations where in place density tests area conducted using a nuclear gauge (ASTM D 2950) as the mix is placed and compacted. Density readings will be obtained at the same location after successive passes with the breakdown, traffic and finish rollers. Rolling with the breakdown roller should continue until the density count peaks or the asphalt mat begins to show signs of over rolling. Rolling with the traffic and finish roller should continue until no further increase in density is indicated. The number of passes with each compactor necessary to achieve these thresholds should be established as the rolling pattern. Test strips should be performed for each asphalt mix type placed on the project.

    b. Cores shall be obtained from the compacted asphalt courses and their density determined in accordance with ASTM D 2726 or D 1188 to correlate the nuclear gauge readings to a direct density measurement. Based on these results, a bias (correction factor) shall be applied to subsequent nuclear density test results as appropriate.

4. In-place density and thickness of compacted pavement will be determined by one of the following methods.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case, will fewer than 3 cores be taken. Core density shall be tested in accordance with ASTM D 1188 or D 2726.

    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION

SECTION 32 13 00

CEMENT CONCRETE PAVEMENT

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. Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.
5. Dumpster Pads

B. Related Sections include the following:

1. Section 310000 "Earthwork" for subgrade preparation, grading, and subbase course.
2. Section 311200 “Hot-Mix Asphalt Paving” for pavement markings
3. Section 321373 "Pavement Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
4. Structural Specifications for "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.

2. Steel reinforcement and reinforcement accessories.

3. Fiber reinforcement.

4. Admixtures.

5. Curing compounds.

6. Applied finish materials.

7. Bonding agent or adhesive.

8. Joint fillers.

E. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work 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.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready-Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Engineers specifications

1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of

each entity directly concerned with concrete pavement to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixes.

c. Ready-mix concrete producer.

d. Concrete subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.

E. Epoxy-Coated Reinforcement Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, deformed bars.

F. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

G. Plain Steel Wire: ASTM A 82, as drawn.

H. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A coated, plain steel.

I. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

J. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.

K. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

L. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.

M. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I or II.

1. Fly Ash: ASTM C 618, Class F or C.

2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Blended Hydraulic Cement: ASTM C 595M, Type IS, portland blast-furnace slag cement.

D. Blended Hydraulic Cement: ASTM C 595M, Type IP portland pozzolan cement.

E. Blended Hydraulic Cement: ASTM C 595M, Type I (PM) pozzolan-modified portland cement.

F. Blended Hydraulic Cement: ASTM C 595M, Type I (SM) slag-modified portland cement.

G. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:

1. Class: 4S.

2. Class: 4M.

3. Class: 1N.

4. Maximum Aggregate Size: 3/4-inch nominal.

5. Do not use fine or coarse aggregates containing substances that cause spalling.

H. Water: ASTM C 94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

G. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

H. Products: Subject to compliance with requirements, provide one of the following:

1. Evaporation Retarder:

   a. Finishing Aid Concentrate; Burke Group, LLC (The).

   b. Sure Film; Dayton Superior Corporation.

   c. Eucobar; Euclid Chemical Co.

   d. Confilm; Master Builders, Inc.

2. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound:

   a. Res-X Cure All Resin; Burke Group, LLC (The).

   b. Day-Chem Rez Cure; Dayton Superior Corporation.

   c. Kurez DR; Euclid Chemical Co.

   d. 3100-Clear; W. R. Meadows, Inc.

3. Clear Waterborne Membrane-Forming Curing Compound:

   a. Aqua Resin Cure; Burke Group, LLC (The).

b. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.

c. 1100 Clear; W. R. Meadows, Inc.

4. White Waterborne Membrane-Forming Curing Compound:

a. Aqua Resin Cure; Burke Group, LLC (The).

b. 1200-White; W. R. Meadows, Inc.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

C. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; as indicated on plans. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate.

1. Dowels: Galvanized steel, diameter of 3/4 inch, minimum length as indicated on the drawings.

D. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.

2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

1. Do not use Owner's field quality-control testing agency as the independent testing agency.

C. Proportion mixes to provide concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.

2. Flexural Strength (28 Days); 650 psi.

3. Maximum Water-Cementitious Materials Ratio: 0.50.

4. Slump Limit: 4 inches.

a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

2. Combined Fly Ash and Pozzolan: 25 percent.

3. Ground Granulated Blast-Furnace Slag: 50 percent.

4. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:

1. Air Content: 4.5 percent for 3/4-inch maximum aggregate.

G. Coloring Agent: Add coloring agent to mix according to manufacturer's written instructions.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

B. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

C. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.

2. For mixers of capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. 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.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

3. Provide tie bars at sides of pavement strips where indicated.

4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

   a. Radius: 1/4 inch.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

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

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Owner.

I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.

2. Do not use frozen materials or materials containing ice or snow.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8-inch-deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.

2. Thickness: Plus 3/8-inch, minus 1/4 inch.

3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/4 inch.

4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.

5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.

6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.

8. Joint Spacing: 3 inches.

9. Contraction Joint Depth: Plus 1/4 inch, no minus.

10. Joint Width: Plus 1/8 inch, no minus.

3.9 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement. Extend upper portion of dowel 5 inches into wheel stop and lower portion as noted on the drawings into pavement.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.

3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.

5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.

6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.

7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

8. When total quantity of a given class of concrete is less than 50 cu. yd., Owner may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.

10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.

C. Test results shall be reported in writing to Owner, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Owner but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Owner. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Owner when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

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

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 13 73

PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Architect's General and Supplementary Conditions and Architects Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within portland cement concrete pavement.

2. Joints between portland cement concrete and asphalt pavement.

B. Related Sections include the following:

1. Section 321200 "Hot-Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.

2. Architects specifications for "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency, based on testing current sealant formulations within a 36-month period.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

2. Test joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturer, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

    a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit not fewer than nine pieces of each type of material, including joint substrates, joint-sealant backer materials, secondary seals, and miscellaneous material.

3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.

5. Testing will not be required if joint sealant manufacturer submits joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.

2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.7 **WARRANTY**

A. General Warranty: 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. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.2 COLD-APPLIED JOINT SEALANTS

A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Type SL Silicone Sealant for Concrete and Asphalt:

a. 890-SL; Dow Corning.

2.3 HOT-APPLIED JOINT SEALANTS

A. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

B. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Elastomeric Sealant for Concrete:

a. Superseal 444/777; Crafco, Inc.

2. Sealant for Concrete and Asphalt:

a. ROADSAVER 221; Crafco Inc.

b. Product #9005; Koch Materials Company.

c. SEALTIGHT HI-SPEC; W.R. Meadows, Inc.

2.4 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.

2. Do not stretch, twist, puncture, or tear backer materials.

3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses provided for each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.

2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 33 10 00

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Architect's General and Supplementary Conditions and Architects Specification Sections, apply to this Section.

B. Madison County Water Department Construction Specifications, latest edition.

ALL WATER DISTRIBUTION WITHIN MADISON COUNTY, AL RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH MADISON COUNTY UTILITIES WATER DEPARTMENT SPECIFICATIONS. ALL OTHER WATER DISTRIBUTION SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

1.2 SUMMARY

A. This Section includes piping and specialties for potable-water service outside the building.

B. This Section includes piping and specialties for fire-protection water service outside the building.

C. This Section does not include tapping of utility company water main.

D. Related Sections include the following:

1. Architects specifications for fire-protection piping inside the building.

2. Architects specifications for potable-water piping inside the building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum operating pressure requirements for piping and specialties, unless otherwise indicated:

1. Potable-Water Service: 200 psig.

2. Fire-Protection Water Service: 350 psig.

3. Fire-Protection Water Service, Downstream from Fire Department Connections: 350 psig.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Water meters.

2. Backflow preventers.

3. Pipe and fittings.

4. Flexible pipe fittings.

5. Valves.

6. Fire hydrants.

7. Fire department connections.

8. Yard hydrants.

9. Fire Department Connections

10. Fire Vaults

B. Shop Drawings: For precast concrete structures. Include frames and covers and drains.

C. Shop Drawings: For cast-in-place concrete structures. Include frames and covers and drains.

D. Record Drawings of installed water-service piping. Record drawings shall be in accordance with Architect Specifications for “Closeout Procedures”.

E. Test Reports: As specified in "Field Quality Control" Article in Part 3.

F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

G. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include data for the following:

1. Water meters.

2. Backflow preventers.

3. Valves.

4. Fire hydrants.

5. Flushing hydrants.

6. Yard hydrants.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Architects Specifications for substitutions.

B. Comply with requirements of utility supplying water. Include tapping of water mains and backflow prevention.

C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.

D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.

E. Comply with standards of authorities having jurisdiction for fire-protection water-service piping and fire hydrants. Include materials, hose threads, installation, and testing.

F. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.

G. Comply with NFPA 291, "Recommended Practice for Fire Flow Testing and Marking of Hydrants," for fire flow tests and marking of hydrants.

H. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.

I. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

J. Listing and Labeling: Provide electrically operated specialties and devices specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.

3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Verify that water-service piping may be installed to comply with original design and referenced standards.

C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate connection to water main with utility company and Owner.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.

C. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.

D. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with municipal requirements, provide products by one of the following:

1. Drilling-Machine, Sleeves, and Corporation Stops:

    a. Ford Meter Box Co., Inc.

    b. Grinnell Corp.; Mueller Co.; Water Products Div.

    c. Lee Brass Co.

2. Bronze Corporation Stops and Valves:

    a. Ford Meter Box Co., Inc.

    b. Grinnell Corp.; Mueller Co.; Water Products Div.

    c. Lee Brass Co.

    d. Master Meter, Inc.

e. Watts Industries, Inc.; James Jones Co.

3. Tapping Sleeves and Valves:

a. American Cast Iron Pipe Co.; Waterous Co.

b. East Jordan Iron Works, Inc.

c. Grinnell Corp.; Mueller Co.; Water Products Div.

d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)

e. McWane, Inc.; Kennedy Valve Div.

f. United States Pipe & Foundry Co.

4. Gate Valves:

a. American AVK Co.

b. American Cast Iron Pipe Co.; American Flow Control Div.

c. American Cast Iron Pipe Co.; Waterous Co.

d. East Jordan Iron Works, Inc.

e. Grinnell Corp.; Grinnell Supply Sales Co.

f. Grinnell Corp.; Mueller Co.; Water Products Div.

g. Hammond Valve Corp.

h. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)

i. McWane, Inc.; Kennedy Valve Div.

j. McWane, Inc.; Tyler Pipe; Utilities Div.

k. United States Pipe & Foundry Co.

5. Relief Valves:

a. Bermad, Inc.

b. Val-Matic Valve and Manufacturing Corp.

6. Water-Regulating Valves:

a. Ames Co., Inc.

b. Bermad, Inc.

c. Cla-Val Co.

d. OCV Control Valves.

e. Watts Industries, Inc.; Water Products Div.

7. Indicator Posts and Indicator Gate Valves:

a. American Cast Iron Pipe Co.; American Flow Control Div.

b. American Cast Iron Pipe Co.; Waterous Co.

c. Grinnell Corp.; Grinnell Supply Sales Co.

d. Grinnell Corp.; Mueller Co.; Water Products Div.

e. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)

f. McWane, Inc.; Kennedy Valve Div.

g. United States Pipe & Foundry Co.

8. Dry-Barrel, Post Fire Hydrants:

a. American AVK Co.

b. American Cast Iron Pipe Co.; American Flow Control Div.

c. American Cast Iron Pipe Co.; Waterous Co.

d. American Foundry & Mfg. Co.

e. East Jordan Iron Works, Inc.

f. Grinnell Corp.; Mueller Co.; Water Products Div.

g. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa)

h. McWane, Inc.; Kennedy Valve Div.

i. McWane, Inc.; M&H Valve Co. Div.

j. United States Pipe & Foundry Co.

k. M & H 129T

9. Water Meters:

a. Badger Meter, Inc.

b. Carlon Meter Co.

c. Grinnell Corp.; Mueller Co.; Hersey Products Div.

d. Schlumberger Industries, Inc.; Water Div.

e. Sensus Technologies, Inc.

10. Detector-Type Water Meters:

a. Badger Meter, Inc.

b. Grinnell Corp.; Grinnell Supply Sales Co.

c. Grinnell Corp.; Mueller Co.; Hersey Products Div.

d. Schlumberger Industries, Inc.; Water Div.

e. Sensus Technologies, Inc.

11. Detector Check Valves:

a. Ames Co., Inc.

b. Grinnell Corp.; Mueller Co.; Hersey Products Div.

c. McWane, Inc.; Kennedy Valve Div.

d. Viking Corp.

e. Watts Industries, Inc.; Water Products Div.

12. Backflow Preventers:

a. Ames Co., Inc.

b. Cla-Val Co.

c. CMB Industries; Febco Div.

d. Conbraco Industries, Inc.

e. Grinnell Corp.; Mueller Co.; Hersey Products Div.

f. Watts Industries, Inc.; Water Products Div.

g. Zurn Industries, Inc.; Wilkins Div.

13. Keyed Couplings:

a. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.

b. Victaulic Co. of America.

14. Protective Enclosures:

a. Hot Box.

b. HydroCowl, Inc.

15. Drains:

a. Enpoco, Inc.

b. Josam Co.

c. McWane, Inc.; Tyler Pipe; Wade Div.

d. Smith Industries, Inc.; Jay R. Smith Mfg. Co.

e. Watts Industries, Inc.; Ancon Drain Div.

f. Zurn Industries, Inc.; Hydromechanics Div.

16. Sanitary-Type Yard Hydrants:

a. Murdock, Inc.

17. Post-Type Yard Hydrants:

a. Josam Co.

b. McWane, Inc.; Tyler Pipe; Wade Div.

c. Smith Industries, Inc.; Jay R. Smith Mfg. Co.

d. Watts Industries, Inc.; Ancon Drain Div.

e. Woodford Mfg. Co.

f. Zurn Industries, Inc.; Hydromechanics Div.

18. Fire Department Connections:

a. Elkhart Brass Mfg. Co., Inc.

b. Figgie International Co.; Badger Fire Protection.

c. Fire-End and Croker Corp.

19. Alarm Devices:

a. Gamewell Co.

b. Grinnell Corp.; Grinnell Supply Sales Co.

c. Pittway Corp.; System Sensor Div.

d. Potter Electric Signal Co.

e. Reliable Automatic Sprinkler Co., Inc.

f. Victaulic Co. of America.

g. Watts Industries, Inc.; Water Products Div.

2.2 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Tube: ASTM B 88, seamless water tube Type “K”, annealed temper.

C. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

D. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

2.3 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.

C. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.

D. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.

E. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

F. Ductile-Iron, Grooved-End Fittings: ASTM A 47, malleable-iron; or ASTM A 536, ductile-iron casting complying with AWWA-pipe size, with grooved ends. Include cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include keyed couplings according to AWWA C606.

G. Ductile-Iron, Flanged Fittings: AWWA C110, with cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include gaskets and bolts and nuts.

H. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Units have 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections. Include 350-psig minimum working-pressure rating; epoxy, interior coating according to AWWA C550; length for offset and expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

I. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

J. Ductile-Iron Expansion Joints: 3-piece assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include 350-psig minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; length for expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

K. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, unless otherwise indicated.

L. AWWA C104, and rubber compression gaskets according to AWWA C111.

M. All Ductile Iron fittings for proposed water mains and fire hydrants shall be domestic made. No foreign made ductile iron fittings will be allowed on proposed water mains.

2.4 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Ductile-Iron Piping: The following materials apply:

1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.

2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.

3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.

a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

4. Keyed Couplings: AWWA C606, consisting of ASTM A 536 ductile-iron housing with enamel finish, with synthetic-rubber gasket with central-cavity, pressure-responsive design, with carbon-steel bolts and nuts to secure grooved pipe and fittings and gasket suitable for hot water, unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8, BCuP Series.

D. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.

E. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.

1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.

3. Gaskets: Rubber.

4. Bolts and Nuts: AWWA C111.

5. Finish: Enamel paint.

2.5 PIPING SPECIALTIES

A. Flexible Connectors for Nonferrous, Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends; brazed to hose.

B. Flexible Connectors for Ferrous Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1 threaded steel pipe nipples or ASME B16.5 steel pipe flanges; welded to hose.

C. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.

1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

2. Dielectric Unions: Factory-fabricated union assembly, designed for 350-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.

3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 350-psig minimum pressure to suit system pressures.

4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

a. Provide separate companion flanges and steel bolts and nuts for 350-psig minimum working pressure to suit system pressures.

5. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 350-psig minimum working pressure at 225 deg F.

6. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 350-psig working pressure at 225 deg F.

2.6 VALVES

A. Nonrising-Stem, Metal-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C500, gray- or ductile-iron body and bonnet; with cast-iron or bronze, double-disc gate, bronze gate rings, bronze stem, and stem nut. Include 200-psig minimum working-pressure design; interior coating according to AWWA C550; and mechanical-joint ends, unless otherwise indicated.

B. Nonrising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.

C. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 250-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.

D. Nonrising-Stem Gate Valves, 4-Inch NPS and Larger: UL 262, FM approved, iron body and bonnet with flange for indicator post, bronze seating material, inside screw, 175-psig working pressure, and mechanical-joint ends. Provide with flanged ends for pit installation.

E. Nonrising-Stem Gate Valves, 2-Inch NPS and Smaller: MSS SP-80; body and screw bonnet of ASTM B 62 cast bronze; with Class 125 threaded ends, solid wedge, nonrising copper-silicon-alloy stem, brass packing gland, PTFE-impregnated packing, and malleable-iron handwheel.

F. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

G. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

H. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.

I. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches in diameter.

1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb-stop head.

J. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.

1. Tapping Sleeve: Cast- or ductile-iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.

K. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.

1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.

2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service piping material.

3. Manifold: Copper with 2 to 4 inlets as required, with ends matching corporation stops and outlet matching service piping.

L. Ball Valves: AWWA C507, Class 250. Include interior coating according to AWWA C550.

M. Butterfly Valves: AWWA C504, with 150-psig working-pressure rating. Include interior coating according to AWWA C550.

N. Check Valves: AWWA C508, with 175-psig working-pressure rating. Include interior coating according to AWWA C550.

O. Check Valves: UL 312, with swing clapper and 175-psig working-pressure rating.

2.7 SPECIALTY VALVES

A. Pressure-Regulating Valves: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550 and ASTM A-536. Include 250-psig working-pressure design, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment.

B. Flow-Regulating Valves: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. Include 250-psig working-pressure design, bronze pressure-reducing pilot valve and tubing, and means for flow adjustment.

C. Air-Release Valve: AWWA C512 and ASTM A-240, hydromechanical device to automatically release accumulated air. Include 300-psig working-pressure design.

D. Air/Vacuum Valve: AWWA C512 and ASTM A-240, direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping. Include 300-psig working-pressure design.

E. Combination Air Valves: AWWA C512, float-operated, hydromechanical device to automatically release accumulated air or to admit air. Include 300-psig working-pressure design.

2.8 WATER METERS

A. Water meters: Contractor is to coordinate water meter installation with the local utility provider.

B. Description: AWWA C700, displacement type, bronze main case. Register flow in gallons.

C. Description: AWWA C703, UL listed, FM approved, main line, proportional, detector type, 150-psig working pressure, with meter on bypass. Register flow in gallons, unless cubic feet are indicated.

1. Bypass Meter: AWWA C702, compound type, bronze case; size at least one-half nominal size of main-line meter.

2. Bypass Meter: AWWA C701, turbine type, bronze case; size at least one-half nominal size of main-line meter.

D. Remote Registration System: Utility company standard; direct-reading type complying with AWWA C706. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

E. Remote Registration System: Utility company standard; encoder-type complying with AWWA C707. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

1. Data-Acquisition Units: Comply with utility company requirements for type and quantity.

2. Visible Display Units: Comply with utility company requirements for type and quantity.

2.9 WATER-METER BOXES

A. Description: Plastic body and cast-iron cover for positive displacement-type water meter. Include lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC plastic, clay or other pipe.

2.10 PITS

A. Description: Precast, reinforced-concrete pit, designed for A-16 load designation according to ASTM C 857, and made according to ASTM C 858.

B. Ladder: ASTM A 36, steel or polyethylene-encased steel steps.

C. Manhole: ASTM A 48, Class No. 35 minimum tensile strength, gray-iron, traffic frame and cover.

1. Weight and Dimensions: Not smaller than 24-inch diameter, unless otherwise indicated.

D. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron, 24-inch minimum-diameter traffic frame and cover.

1. Weight and Dimensions: Not smaller than 24-inch diameter, unless otherwise indicated.

E. Drain: ASME A112.21.1M, cast-iron area drain, of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.11 FREESTANDING FIRE HYDRANTS

A. Description: Cast-iron body, compression-type valve, opening against pressure and closing with pressure, 6-inch mechanical-joint inlet, and 200-psig minimum working-pressure design or as required by the governing municipal agency.

B. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.

C. Operating and Cap Nuts: Pentagon 1-1/2 inch point to flat.

D. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.

E. Exterior Finish: Gloss enamel paint. Per Governing Municipal Requirements.

F. Dry-Barrel Fire Hydrants: AWWA C502, two 2-1/2-inch NPS and one 6-inch NPS outlets, 5-1/4-inch main valve, drain valve, and 6-inch NPS mechanical-joint inlet. Include 250-psig minimum working-pressure design and interior coating according to AWWA C550.

2.12 FIRE DEPARTMENT CONNECTIONS

A. Exposed, Freestanding, Fire Department Connections: UL 405, cast-brass body, with thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate.

1. Connections: Per Huntsville Fire Department requirements.

2. Inlet Alignment: Per Huntsville Fire Department requirements.

3. Finish Including Sleeve: Per Huntsville Fire Department requirements.

4. Escutcheon Plate Marking: Per Huntsville Fire Department requirements.

2.13 DETECTOR CHECK VALVES

A. Detector Check Valves: UL 312, galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends; designed for 200-psig working pressure. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.

1. Water Meter: AWWA C700, disc type, of size at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

B. Detector Check Valve: UL 312, FM-approved detector check, iron body, corrosion-resistant clapper ring and seat ring material, 200-psig working pressure, flanged ends, with connections for bypass and installation of water meter.

2.14 BACKFLOW PREVENTERS

A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

B. Working Pressure: 200 psig minimum, unless otherwise indicated.

C. 2-Inch NPS and Smaller: Bronze body with threaded ends.

D. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

E. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.

F. Interior Components: Corrosion-resistant materials.

G. Strainer on inlet if strainer is indicated.

H. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

I. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.

1. Pressure Loss: 12 psig maximum through middle third of flow range.

J. Reduced-Pressure-Principle Backflow Preventer: AWWA C511, with OS gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.

1. Pressure Loss: 12 psig maximum through middle third of flow range.

K. Double-Check Backflow Prevention Assemblies: ASSE 1015, with valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous-pressure application.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

L. Double-Check-Valve Assembly: AWWA C510, with OS&Y gate valves on inlet and outlet, and strainer on inlet.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

M. Double-Check-Valve Assembly: UL 312, FM approved. Assembly has two UL 312, FM-approved, iron-body, 200-psig working-pressure, flanged-end check valves, with two UL 262, FM-approved, iron-body, OS&Y, flanged, 200-psig working-pressure gate valves.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

N. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

O. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves, test cocks, and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer, for continuous-pressure application.

1. Pressure Loss: 12 psig maximum through middle third of flow range.

P. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include 2 positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous-pressure application.

1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.15 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.

1. Cement: ASTM C 150, Type I.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

2.16 ALARM DEVICES

A. Description: UL 753, FM approved, of types and sizes to mate and match piping and equipment.

B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with 2 SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 A 125 V, ac and 0.25 A 24 V, dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.

C. Supervisory Switches: SPDT, designed to signal valve in other than full open position.

D. Pressure Switches: SPDT, designed to signal increase in pressure.

2.17 IDENTIFICATION

A. Refer to Section 310000 "Earthwork" for underground warning tape materials.

B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches, with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 310000 "Earthwork" for excavation, trenching, and backfilling.

B. Refer to Section 321200 "Hot-Mix Asphalt Paving" for cutting and patching of existing paving.

C. Refer to Section 321300 "Concrete Paving" for cutting and patching of paving.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

C. Do not use flanges or keyed couplings for underground piping.

1. Exception: Piping in boxes and structures, but not buried, may be joined with flanges or keyed couplings instead of joints indicated.

D. Flanges, keyed couplings, and special fittings may be used on aboveground piping.

E. Potable Water-Service Piping: Use the following:

1. Up to NPS 5: Soft copper tube, Type K (Type A); wrought-copper fittings and brazed joints.

2. NPS 6 and larger: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

F. Fire-Protection Water-Service Piping: Use the following:

1. 4- to 8-Inch NPS: Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.

2. 4- to 8-Inch NPS: Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, 3-Inch NPS and Larger: AWWA, gate valves, nonrising stem, with valve box.

2. Underground Valves, 4-Inch NPS and Larger: UL/FM, gate valves, nonrising stem, with indicator post.

3. Pit and Aboveground Installation Valves, 3-Inch NPS and Larger: AWWA, OS&Y gate valves.

4. Pit and Aboveground Installation Valves, 2-1/2-Inch NPS and Larger: UL/FM, OS&Y gate valves.

5. Pit and Aboveground Installation Valves, 2-Inch NPS and Smaller: MSS, nonrising-stem gate valves.

6. Pit and Aboveground Installation Valves, 2-Inch NPS and Smaller: UL/FM, OS&Y gate valves.

3.4 JOINT CONSTRUCTION

A. Ductile-Iron Piping, Gasketed Joints: According to AWWA C600.

B. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.

C. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.

D. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to fitting and valve ends into which pipes are being threaded.

E. Ductile-Iron, Keyed-Coupling Joints: Cut-groove pipes. Assemble joints with keyed couplings, gaskets, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

F. Copper Tubing, Brazed Joints: According to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

G. Copper Tubing, Soldered Joints: According to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."

H. Copper Tubing, Soldered Joints: According to CDA's "Copper Tube Handbook."

I. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings 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.

B. Install piping at indicated slope.

C. Install components with pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install fittings for changes in direction and branch connections.

G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Install dielectric fittings to connect piping of dissimilar metals.

3.6 SERVICE ENTRANCE PIPING

A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with valve and cap, plug, or flange as required for piping material. Make connections to building water piping systems when those systems are installed.

B. Sleeves and mechanical sleeve seals are specified in the Architect specifications "Basic Mechanical Materials and Methods."

C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

D. Anchor service-entry piping to building wall.

3.7 PIPING INSTALLATION

A. Water-Main Connection: Arrange for tap in water main, of size and in location indicated, from water utility.

B. Make connections larger than 2-inch NPS with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to manufacturer's written instructions.

2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.

3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.

4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.

C. Connection of the new 8-inch ductile iron water main to the existing 12-inch high pressure water main shall be with 12-inch x 8-inch Tee in accordance with Athens Utilities Standards.

D. Comply with NFPA 24 for fire-protection water-service piping materials and installation.

E. Install ductile-iron piping according to AWWA C600.

F. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

G. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36 inches cover over top.

2. Under Railroad Tracks: With at least 48 inches cover over top.

3. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.

H. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

3.8 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.

2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.

3. Fire-Service Piping: According to NFPA 24.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

A. General Application: Use mechanical-joint-end valves for 3-inch NPS and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use nonrising-stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.

C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

3.10 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA-Type Fire Hydrants: Comply with AWWA M17.

D. UL/FM-Type Fire Hydrants: Comply with NFPA 24.

3.11 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.12 PIT CONSTRUCTION AND INSTALLATION

A. Construct pits of cast-in-place concrete pits, with manhole frame and cover, ladder, and drain. Include sleeves with waterproof mechanical sleeve seals for pipe entry and exit. Refer to Structural Specifications for "Cast-in-Place Concrete."

B. Install precast concrete pits according to ASTM C 891.

C. Connect area drain outlet to storm drainage piping. Refer to Section 334000 "Storm Drainage."

3.13 DETECTOR CHECK VALVE INSTALLATION

A. Install detector check valves in pits for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

B. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.14 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to plumbing and health department authorities having jurisdiction.

B. Do not install reduced-pressure-principle type in pit.

C. Do not install bypass around backflow preventer.

D. Support backflow preventers, valves, and piping on brick or concrete piers.

3.15 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install fire department connections of types and features indicated.

B. Install ball drip valves at each check valve for fire department connection to mains.

3.16 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with curb boxes do not require supervision. Coordinate with Architect Specifications for “Fire Protection”.

B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.

2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

~~C. Locking and Sealing: Secure unsupervised valves as follows:~~

~~1. Valves: Install chain and padlock on open OS&Y gate valve.~~

~~2. Post Indicators: Install padlock on wrench on indicator post.~~

D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.

E. Water-Flow Indicators: Install in water-service piping in pit. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

F. Connect alarm devices to building fire alarm system. Refer to Architect Specifications for "Fire Alarm Systems" for wiring and devices not specified in this Section.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified independent testing agency to perform field quality-control testing. Testing agency must be acceptable to the municipality having jurisdiction over the work being tested.

B. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage to be per municipal requirements. Remake leaking joints with new materials and repeat test until leakage is within above limits.

2. The amount of leakage in piping shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed two quarts per hour per 100 gaskets or joints irrespective of pipe diameter.

3. The amount of leakage specified above may be increased by one fluid ounce per inch valve diameter per hour for each metal seated valve isolating the test section. If dry barrel hydrants are under pressure, an additional five ounces per minute leakage is permitted for each hydrant.

4. Test certificate contained at the end of this Section shall be submitted.

D. Prepare reports for testing activities.

3.18 CLEANING

A. Clean and disinfect water distribution piping as follows:

1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by that authority, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.

b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

c. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports for purging and disinfecting activities.

END OF SECTION

CONTRACTOR'S MATERIAL & TEST CERTIFICATE FOR UNDERGROUND PIPING

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME _____ DATE _____

PROPERTY ADDRESS _____

_____

_____

PLANS

ACCEPTED BY APPROVING AUTHORITY('S) NAMES _____

ADDRESS _____

_____

INSTALLATION CONFORMS TO ACCEPTED PLANS ☐ YES ☐ NO EQUIPMENT USED IS APPROVED ☐ YES ☐ NO

IF NO, STATE DEVIATIONS _____

_____

INSTRUCTIONS

HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THIS NEW EQUIPMENT? ☐ YES ☐ NO IF NO, EXPLAIN _____

_____

HAVE COPIES OF APPROPRIATE INSTRUCTIONS AND CARE AND MAINTENANCE CHARTS BEEN LEFT ON PREMISES? ☐ YES ☐ NO

IF NO, EXPLAIN _____

_____

LOCATION

SUPPLIES BUILDINGS _____

UNDERGROUND PIPES AND JOINTS

PIPE TYPES AND CLASS _____ TYPE JOINT _____

PIPE CONFORMS TO _____ STANDARD ☐ YES ☐ NO IF NO, EXPLAIN _____

FITTINGS CONFORM TO _____ STANDARD ☐ YES ☐ NO IF NO, EXPLAIN _____

_____

JOINTS NEEDING ANCHORAGE CLAMPED, STRAPPED, OR BLOCKED IN ACCORDANCE WITH _____ STANDARD ☐ YES ☐ NO

IF NO, EXPLAIN _____

_____

TEST DESCRIPTION

FLUSHING:

Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm (1476 L/min) for 4-in. pipe, 610 gpm (2309 L/min) for 5-in. pipe, 880 gpm (3331 L/min) for 6-in. pipe, 1500 gpm (5905 L/min) for 8-in. pipe, 2440 gpm (9235 L/min) for 10-in. pipe, and 3520 gpm (13,323 L/min) for 12-in. pipe. When supply cannot produce stipulated flow rates, obtain maximum available.

HYDROSTATIC:

Hydrostatic tests shall be made at not less than 200 psi (13.8 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.3 bars) for two hours.

LEAKAGE:

New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qts per hr (1.89 L/h) per 100 joints irrespective of pipe diameter. The amount of allowable leakage specified above may be increased by 1 fl oz per in. valve diameter per hr (30 mL/25 mm/h) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open so that the hydrants are under pressure, an additional 5 oz per min (150 mL/min) leakage is permitted for each hydrant.

Figure A-8-9.1 Typical Contractor's Material and Test Certificate for Underground Piping

FLUSHING TESTS

NEW UNDERGROUND PIPING FLUSHED ACCORDING TO_____ STANDARD ☐ YES ☐ NO

BY *(COMPANY)* _____

IF NO, EXPLAIN _____

_____

HOW FLUSHING FLOW WAS OBTAINED: ☐ PUBLIC WATER ☐ TANK OR RESERVOIR ☐ FIRE PUMP

THROUGH WHAT TYPE OPENING: ☐ HYDRANT BUTT ☐ OPEN PIPE

LEAD-INS FLUSHED ACCORDING TO _____ STANDARD ☐ YES ☐ NO

BY *(COMPANY)* _____

IF NO, EXPLAIN _____

_____

HOW FLUSHING FLOW WAS OBTAINED: ☐ PUBLIC WATER ☐ TANK OR RESERVOIR ☐ FIRE PUMP

THROUGH WHAT TYPE OPENING: ☐ Y CONN. TO FLANGE & SPIGOT ☐ OPEN PIPE

HYDROSTATIC TEST

ALL NEW UNDERGROUND PIPING HYDROSTATICALLY TESTED AT_____PSI FOR _____ HOURS

JOINTS COVERED ☐ YES ☐ NO

LEAKAGE TEST

TOTAL AMOUNT OF LEAKAGE MEASURED _____ GALLONS _____ HOURS

ALLOWABLE LEAKAGE _____ GALLONS_____ HOURS

HYDRANTS

NUMBER INSTALLED _____ TYPE AND MAKE _____ ALL OPERATE SATISFACTORILY ☐ YES ☐ NO

CONTROL VALVES

WATER CONTROL VALVES LEFT WIDE OPEN ☐ YES ☐ NO IF NO, STATE REASON _____

_____

HOSE THREADS OF FIRE DEPARTMENT CONNECTIONS AND HYDRANTS INTERCHANGEABLE WITH THOSE OF FIRE DEPARTMENT ANSWERING ALARM ☐ YES ☐ NO

REMARKS

DATE LEFT IN SERVICE_____REMARKS _____

_____

_____

_____

SIGNATURES

NAME OF INSTALLING CONTRACTOR _____

TESTS WITNESSED BY

FOR PROPERTY OWNER *(SIGNED)* _____ TITLE _____ DATE _____

FOR INSTALLING CONTRACTOR *(SIGNED)* _____ TITLE _____ DATE _____

ADDITIONAL EXPLANATION AND NOTES

Figure A-8-9.1 (continued)

SECTION 33 30 00

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Architect's General and Supplementary Conditions and Architects Specification Sections, apply to this Section.

B. City of Huntsville, AL Water Pollution Control Standards and Construction Specifications for Sanitary Sewer.

ALL SANITARY SEWERAGE COLLECTION SYSTEMS CONSTRUCTED WITHIN CITY OF HUNTSVILLE, AL RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH CITY OF HUNTSVILLE WATER POLLUTION CONTROL STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR SANITARY SEWER. ALL OTHER SANITARY SEWER SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

ALL SANITARY SEWERAGE LINES TERMINATED BY MANHOLES MUST BE TESTED IN ACCORDANCE WITH CITY OF HUNTSVILLE WATER POLLUTION CONTROL REQUIREMENTS.

1.2 SUMMARY

A. This Section includes sanitary sewerage outside the building.

B. Related Sections include the following:

1. Structural specifications for "Cast-in-Place Concrete" for concrete structures.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Stainless-steel drainage systems.

2. Backwater valves and cleanouts.

3. Manhole cover inserts.

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete manholes, including frames and covers.

2. Cast-in-place concrete manholes and other structures, including frames and covers.

C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1. Record Drawings of constructed sanitary sewer mains and services. Upon completion of Sanitary Sewer Lines terminated by manholes, TVI Testing and As-Built drawings must be completed and the results sent to City of Huntsville Water Pollution Control Department. Contractor shall the perform vacuum and pressure tests in accordance with City of Huntsville Water Pollution Control requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with municipal requirements, provide products by one of the following:

1. Stainless-Steel Drainage Systems:

a. Josam Co.; Blucher-Josam Div.

2. Gray-Iron Backwater Valves and Cleanouts:

a. Josam Co.

b. McWane, Inc.; Tyler Pipe; Wade Div.

c. Smith: Jay R. Smith Mfg. Co.

d. Watts Industries, Inc.; Ancon Drain Div.

e. Watts Industries, Inc.; Enpoco, Inc. Div.

f. Zurn Industries, Inc.; Hydromechanics Div.

3. PVC Backwater Valves and Cleanouts:

a. Canplas, Inc.

b. IPS Corp.

c. NDS, Inc.

d. Plastic Oddities, Inc.

e. Sioux Chief Manufacturing Co., Inc.

4. Manhole Cover Inserts:

a. FRW Industries, Inc.

b. Knutson Manufacturing Co.

c. Neenah Foundry, Inc.

d. Parson Environmental Products, Inc.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

A. Ductile-Iron Sewer Pipe: ASTM A 746, AWWA C150 and AWWA C151, for push-on joints.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.

2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.

3. Gaskets: AWWA C111, rubber.

4. Be thickness pressure class 350.

5. Be cement lined in accordance with AWWA C104.

B. PVC Pressure Pipe: AWWA C900, Class 150, for gasketed joints.

1. PVC Pressure Fittings: AWWA C907, for gasketed joints.

2. Gaskets for PVC Piping: ASTM F 477, elastomeric seals.

3. Ductile-Iron, Compact Fittings: AWWA C153, for push-on joints.

4. Gaskets for Ductile-Iron Fittings: AWWA C111, rubber.

C. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.

2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.

3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.

4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.

5. Bands: Stainless steel, at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.

1. Material for Concrete Pipe: ASTM C 443, rubber.

2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.

3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.

4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

C. Pressure-Type Pipe Couplings: AWWA C219, iron-body sleeve assembly matching OD of pipes to be joined, with AWWA C111 rubber gaskets, bolts, and nuts. Include PE film, pipe encasement.

D. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed

ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated. Include PE film, pipe encasement.

E. Ductile-Iron Deflection Fittings: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees deflection. Include PE film, pipe encasement.

F. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.5 PE FILM, PIPE ENCASEMENT

A. ASTM A 674 or AWWA C105; PE film, tube, or sheet; 8-mil thickness.

2.6 MANHOLES

A. Heavy Duty- Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.

2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.

4. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.

5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

6. Gaskets: ASTM C 443, rubber.

7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and cover.

8. Steps: Conforming to ASTM-C478, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch intervals.

9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.

2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and cover.

3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12-inch intervals.

4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12-inch intervals.

C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch diameter cover. Include indented top design with lettering "SANITARY SEWER" or as required by the governing municipality, cast into cover.

2.7 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 0.2’ fall measured from inlet to outlet.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 8 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.8 PROTECTIVE COATINGS (If required on drawings)

A. Description: Two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Concrete Manholes: On interior surface.

2. Manhole Frames and Covers: On surfaces that will be exposed to sewer gases.

2.9 BACKWATER VALVES

A. Gray-Iron Backwater Valves: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

1. Horizontal Type: With swing check valve and hub-and-spigot ends.

2. Combination Horizontal and Manual Gate-Valve Type: With swing check valve, integral gate valve, and hub-and-spigot ends.

3. Terminal Type: With bronze seat, swing check valve, and hub inlet.

B. PVC Backwater Valves: Similar to ASME A112.14.1, horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.10 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Light Duty: In earth or grass foot-traffic areas.

2. Medium Duty: In paved foot-traffic areas.

3. Extra-Heavy Duty: In all vehicle-traffic service areas.

4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 310000 "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section 310000 "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 4 and NPS 6: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.

2. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

3. NPS 8 and NPS 10: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.

4. NPS 8 and NPS 10: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

5. NPS 12 and NPS 15: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.

b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.

2. Install piping with 36-inch minimum cover.

F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C105.

C. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.

2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.

3. Install according to ASTM D 2321.

D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

F. Install with top surfaces of components, except piping, flush with finished surface.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops at elevations noted on the drawings.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.9 BACKWATER VALVE INSTALLATION

A. Install horizontal units in piping where indicated.

B. Install combination units in piping and in structures where indicated.

C. Install terminal units on end of piping and in structures where indicated. Secure units to structure walls.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, per the details on the drawings. Set with tops at elevations noted on the drawings.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.11 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as local municipality requirements and nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.12 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. Place plug in end of incomplete piping at end of day and when work stops.

2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects. All testing listed below shall be performed by the Con-

tractor with certification of all testing provided by the Owner's Testing Agency. Testing shall be in accordance with City of Huntsville Water Pollution Control Department.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to authorities having jurisdiction.

3. Upon completion of Sanitary Sewer Lines terminated by manholes, TVI Testing and As-Built drawings must be completed and the results sent to City of Huntsville Water Pollution Control Department. Contractor shall the perform vacuum and pressure tests in accordance with City of Huntsville Water Pollution Control requirements.

4. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

5. Submit separate reports for each test.

6. Manholes: Perform hydraulic test according to ASTM C 969.

7. Leaks and loss in test pressure constitute defects that must be repaired.

8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

ALL STORM DRAINAGE WITHIN MADISON COUNTY RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH MADISON COUNTY SPECIFICATIONS. ALL OTHER STORM DRAINAGE SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

1.2 SUMMARY

A. This Section includes storm drainage outside the building.

B. Related Sections include the following:

1. Structural Specifications Section "Cast-in-Place Concrete" for concrete structures.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene-monomer rubber.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

E. HDPE: High Density Polyethylene

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Backwater valves, cleanouts, and drains.

2. Flap Valves

B. As-Built Record: Record drawings shall not be required for this project.

C. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete manholes and other structures, including frames, covers, and grates.

2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions. No utility interruptions are allowed without the Owner’s written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gray-Iron Backwater Valves, Cleanouts, and Drains:

a. Josam Co.

b. McWane, Inc.; Tyler Pipe; Wade Div.

c. MIFAB.

d. Smith: Jay R. Smith Mfg. Co.

e. Watts Industries, Inc.; Ancon Drain Div.

f. Watts Industries, Inc.; Enpoco, Inc. Div.

g. Zurn Industries, Inc.; Hydromechanics Div.

2. Modular Engineered Area Inlets
    a. Nyoplast-Advanced Drainage Systems, Inc.
    b. Approved Equal
3. PVC Backwater Valves and Cleanouts:
    a. Canplas, Inc.
    b. IPS Corp.
    c. NDS, Inc.
    d. Plastic Oddities, Inc.
    e. Sioux Chief Manufacturing Co., Inc.
4. Trench Drain System:
    a. ACO Polymer Products, Inc.
    b. Approved equal
5. Elastomeric in Line Storm Drain Check Valve
    a. Tideflex Technologies
    b. Approved equal
6. Flap Valves:
    a. Kennedy Valve Company
    b. Rodney Hunt Company
    c. Approved equal

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

A. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
    1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
    2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
    3. Gaskets: AWWA C111, rubber.

B. Ductile-Iron Culvert Pipe: ASTM A 716, for push-on joints.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.

2. Gaskets: AWWA C111, rubber.

C. Corrugated-Steel Pipe: ASTM A 760/A 760M, Type I, made from ASTM A 929/A 929M, zinc-coated steel sheet for banded joints.

1. Fittings: Fabricated to types indicated and according to same standards as pipe.

2. Connecting Bands: Standard couplings made for corrugated-steel pipe to form soil-tight joints.

3. Pipe shall have full bituminous coating and paved invert conforming to the requirements of AASHTO M190.

D. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

E. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.

1. Gaskets: ASTM C 443, rubber.

F. HDPE Pipe and Fittings: According to the following:

1. HDPE Pipe: ASTM F2648. Pipe shall have smooth interior and annular exterior corrugations.

2. Joints: ASTM F2648. Bell & spigot, soil-tight.

3. Gaskets: ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

4. Fittings: ASTM F 2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F 2306.

5. Testing: The manufacturer shall utilize third party testing to document compliance with applicable specification standards.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.

2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.

3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.

4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.

5. Bands: Stainless steel, at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.

1. Material for Concrete Pipe: ASTM C 443, rubber.

2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.

3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.

4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

C. Pressure-Type Pipe Couplings: AWWA C219, iron-body sleeve assembly matching OD of pipes to be joined, with AWWA C111 rubber gaskets, bolts, and nuts. Include PE film, pipe encasement.

D. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated. Include PE film, pipe encasement.

E. Ductile-Iron Deflection Fittings: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees deflection. Include PE film, pipe encasement.

F. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

G. Elastomeric In Line Storm Drain Check Valve - Check Valves are to be all rubber and the flow operated check type with slip-in cuff or flange connection. The entire Valve shall be ply reinforced throughout the body, disc and bill, which is cured and vulcanized into a one-piece unibody construction. A separate valve body or pipe used as the housing is not acceptable. The valve shall be manufactured with no metal, mechanical hinges or fasteners, which would be used to secure the disc or bill to the valve housing. The port area of the disc shall contour down, which shall allow passage of flow in one direction while preventing reverse flow. The entire valve shall fit within the pipe I.D. Once installed, the Valve shall not protrude beyond the face of the structure or end of the pipe.

The downstream end of the valve must be circumferentially in contact with the pipe while in the closed positions.

Slip-in style valves will be furnished with a set of stainless-steel expansion clamps. The clamps, which will secure the valve in place, shall be installed inside the cuff portion of the valve, based on installation orientation, and shall expand outwards by means of a turn-buckle. Each clamp shall be pre-drilled allowing for the valve to be pinned and secured into position in accordance with the manufacturer’s installation instructions.

Manufacturer must have flow test data from an accredited hydraulics laboratory to confirm pressure drop and hydraulic data. Company name, plant location, valve size patent number, and serial number shall be bonded to the check valve.

2.5 PE FILM, PIPE ENCASEMENT

A. ASTM A 674 or AWWA C105; PE film, tube, or sheet; 8-mil thickness.

2.6 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.

2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.

4. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.

5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

6. Gaskets: ASTM C 443, rubber.

7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and cover.

8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch intervals.

9. Steps: ASTM C 478, individual steps or ladder.

10. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.

2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and cover.

3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12-inch intervals.

4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12-inch intervals.

C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

D. Masonry units, brick or concrete masonry units, shall not be utilized as riser sections, rings or leveling material.

2.7 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.

2. Riser Sections: 5-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.

3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

4. Gaskets: ASTM C 443, rubber.

5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and grate.

6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12-inch intervals.

7. Steps: ASTM C 478, individual steps or ladder.

8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.

2. Channels and Benches: Concrete.

3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12-inch intervals.

4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12-inch intervals.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum, unless otherwise indicated.

2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

D. Masonry units, brick or concrete masonry units, shall not be utilized as riser sections, rings or leveling material.

2.8 STORMWATER INLETS

A. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.

B. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.

C. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.

D. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.

1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.

2. Material: ASTM A 48, Class 30 minimum, gray-iron casting.

3. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

E. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

F. Modular Engineered Curb Inlets: The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. hall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. The grates furnished for all surface drainage inlets shall be ductile iron grates and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for drain basins shall be capable of supporting H-25 wheel loading for heavy-duty traffic or H-10 loading for pedestrian traffic. Grates shall be provided painted black.

1. Joint tightness: ASTM D3212

2. Material: ASTM D3034

3. Gasketed Fittings: ASTM F1336

4. Ductile Iron Castings: ASTM A536 grade 70-50-05

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Include channels and benches in manholes.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: as noted on the drawings.

b. Benches: Concrete, sloped to drain into channel.

1) Slope: 8 percent.

2. Include channels in catch basins.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: as noted on the drawings.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.10 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or

spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Light Duty: In earth or grass foot-traffic areas.

2. Medium Duty: In paved foot-traffic areas.

3. Heavy Duty: In vehicle-traffic service areas.

4. Extra-Heavy Duty: In roads.

5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.11 DRAINS

A. Gray-Iron Area Drains: ASME A112.21.1M, round, gray-iron body with anchor flange and round, secured, gray-iron grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated. Use units with top-loading classifications according to the following applications:

1. Medium Duty: In paved foot-traffic areas.

2. Heavy Duty: In vehicle-traffic service areas.

B. PVC Surface Drainage Inlets: PVC surface drainage inlets shall include the drain basin type as indicated on the drawings. The ductile iron grates are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The surface drainage inlets shall be as manufactured by Nyloplast, a division of Advanced Drainage Systems, Inc., or approved equal.

1. Drain Basin Materials: The drain basins shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.

2. Grates and Frames Materials: The grates and frames furnished for all surface drainage inlets shall be ductile iron for sizes 8”, 10”, 12”, 15”, 18”, 24” and 30” and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for drain basins shall be capable of supporting H-20 wheel loading for traffic areas or H-10 loading for pedestrian areas. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron. Grates shall be provided painted black.

C. Heavy Duty Polymer Trench Drain System With Slotted Grate: The Trench Drain system shall be ACO Drain S300K complete with Load Class F Slotted gratings secured with 'PowerLok' locking as manufactured by ACO Polymer Products, Inc. or approved equal.

1. Materials - The trench system bodies shall be manufactured from polyester polymer concrete with minimum properties as follows:

Compressive strength: 14,000 psi

Flexural strength: 4,000 psi

Water absorption 0.07%

Frost proof

Salt proof

Dilute acid and alkali resistant

2. Configuration - The nominal clear opening shall be 12" (300mm) with overall width of 14.17" (360mm). Pre-cast units shall be manufactured with an invert slope of 0.6% and have a wall thickness of at least 1.18" (30mm). Each unit will feature a full radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring features on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface. The ductile iron edge rail will be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 1/4" (6mm) thick.

3. Grates - Slotted ductile iron grates are tested to DIN 19580 Load Class F - 200,000lbs - 3,485psi. Ductile iron to ASTM 536-84 - Grade 65-45-12. After removal of grates there shall be uninterrupted access to the trench to aid maintenance.

D. Sidewalk Duty Polymer Trench Drain System With Slotted Grate: The surface drainage system shall be ACO Drain K100S complete with gratings secured with 'QuickLok' locking as manufactured by ACO Polymer Products, Inc. or approved equal.

1. Materials - The trench system bodies shall be manufactured from polyester polymer concrete with minimum properties as follows:

Compressive strength: 14,000 psi

Flexural strength: 4,000 psi

Water absorption 0.07%

Frost proof

Salt proof

Dilute acid and alkali resistant

2. Configuration - The nominal clear opening shall be 4.00” (100mm) with overall width of 5.10” (130mm). Pre-cast units shall be manufactured with either an invert slope of 0.6% or with neutral invert and have a wall thickness of at least 0.50” (13mm). Each unit will feature a full radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring features on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface. The galvanized steel edge rail will be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 1/8” (3mm) thick.

3. Ductile Iron Grates - Slotted ductile iron grates ACO Type 477 Grid ductile iron grate with ‘QuickLok’ locking as manufactured by ACO Polymer Products, Inc. or approved equal.
Materials: The covers shall be manufactured from ductile iron and have minimum properties as follows:

   • Independently certified to meet Load Class D to DIN 19580 - 90,000 lbs - 1,859 psi

   • Ductile iron to ASTM A 536-84 - Grade 65-45-12

   • Intake area of 39.7 sq. in. (256.1 cm²) per half meter of grate

   Overall width of 4.84” (123mm) and overall length of 19.69” (500mm). Slots measure 1.0” (25mm) by 1.73” (44mm). After removal of grates there shall be uninterrupted access to the trench to aid maintenance.

4. Plastic Grates at Tennis Courts, etc. - Slotted plastic grates ACO Type 494 polypropylene grate with ‘QuickLok’ locking as manufactured by ACO Polymer Products, Inc. or approved equal.
Materials: The covers shall be manufactured from polypropylene and have minimum properties as follows:

   • Independently certified to meet Load Class A to EN 1433 - 3,500 lbs - 70 psi

   • UV stable polypropylene

   • Intake area of 27.4 sq. in. (176.8 cm²) per half meter of grate

2.12 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregular size and shape, graded stone.

   1. Average Size: NSA No. R-5, screen opening 6 inches.

C. Filter Stone: NSA No. FS-2, No. 4 screen opening, average-size, graded stone.

D. Energy Dissipators: NSA No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

2.13 FLAP VALVES

A. General: The Flap Valve, size as indicated on the drawings and valve schedule, will be flange framed with resilient seats, such as Rodney Hunt Series FV-AC or approved equal.

B. Body: The body will be cast iron, ASTM A126 Class B. The angle of the cover to the vertical, when seated shall be between 2 degrees and 5 degrees from the vertical and be consistent with the proper operation of the gate.

C. Seat: Resilient seat, neoprene or Buna-N, will be bonded in a groove machined in the body to provide a wide seating surface for the seat machined on the cover.

D. Cover: The cover, or flap, will be cast iron, ASTM A126 Class B, with spherically dished design to withstand maximum operating loads.

E. Hinge: The hinge arms will be No. 1 manganese bronze, ASTM B584 C865. The hinge pins, designed in double shear, will be silicon bronze, ASTM B98 C655, or Type 304 stainless steel. Each hinge arm will have two pivot points, an adjustable lower pivot with limited rotation and a threaded upper hinge post to adjust flap valve sensitivity. A lubrication fitting will be supplied for each pivot.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 310000 "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section 310000 "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 8 to NPS 15: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 8 to NPS 12. Use ductile-iron culvert pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 14 to NPS 16.

2. NPS 8 to NPS 15: Corrugated-steel pipe and fittings, connecting bands, and banded joints.

3. NPS 8 to NPS 15: Corrugated PE drainage tubing and fittings, silttight couplings, and coupled joints in NPS 8 and NPS 10. Use corrugated PE pipe and fittings, silttight couplings, and coupled joints in NPS 12 and NPS 15.

4. NPS 8 to NPS 15: PVC, SDR 35, sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

5. NPS 12 and NPS 15: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints. Do not use nonreinforced pipe instead of reinforced concrete pipe in NPS 8 and NPS 10.

6. NPS 18 to NPS 36: Ductile-iron culvert pipe; standard-pattern, cast-iron or ductile-iron fittings; gaskets; and gasketed joints.

7. NPS 18 to NPS 36: Corrugated-steel pipe and fittings, connecting bands, and banded joints.

8. NPS 18 to NPS 36: PVC, ribbed drain pipe and fittings; gaskets; and gasketed joints.

9. NPS 18 to NPS 36: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.

10. NPS 18 to NPS 36: Reinforced-concrete arch pipe, sealing bands, and banded joints.

11. NPS 18 to NPS 36: Reinforced-concrete, elliptical pipe, Type HE, horizontal; sealing bands; and banded joints.

12. NPS 42 to NPS 120: Corrugated-steel pipe and fittings, connecting bands, and banded joints.

13. NPS 42 to NPS 144: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.

b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

C. Elastomeric In Line Storm Drain Check Valve - Valve shall be installed in accordance with manufacturer's written installation and operation manual and approved submittals.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

2. Install piping with cover as noted on the drawings.

F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

1. Install PE film, pipe encasement over hubless cast-iron soil pipe and fittings according to ASTM A 674 or AWWA C105.

B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C105.

C. HDPE Drainage Pipe: According with ASTM D2321. Minimum cover for diameters 4-inch through 48-inch shall be one foot. Minimum cover for 60-inch diameter shall be two feet. Backfill for minimum cover situations shall consist of Class 1 (compacted), or Class 2 (minimum 90% SPD).

D. Install with top surfaces of components, except piping, flush with finished surface.

E. Corrugated-Steel Pipe: Join and install according to ASTM A 798. Use soiltight joints made with coupling bands and gaskets, unless otherwise indicated.

F. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

G. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.

2. Install according to ASTM D 2321.

H. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.

I. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

J. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

3.8 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.10 MODULAR ENGINEERED DRAINAGE INLETS

A. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures.

B. The backfill material shall be crushed stone or other granular material meeting the requirements of class 1 or 2 material as defined in ASTM D2321.

C. The surface drainage inlets shall be bedded and back-filled uniformly in accordance with ASTM D2321.

D. The drain basin body will be cut at the time of the final grade so as to maintain a one piece, leak proof structure. No brick, stone or concrete block will be used to set the grate to the final grade height.

E. For H-25 Load rated installations, an 8” to 10” thick concrete ring will be poured under the grate and frame as recommended by details provided from the manufacturer.

3.11 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.12 DRAINAGE SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions.

B. Assemble and install stainless-steel drainage systems according to ASME A112.3.1 and manufacturer's written instructions.

C. Install with top surfaces of components, except piping, flush with finished surface.

D. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

E. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

F. Fasten grates to channel sections if indicated.

G. Assemble trench sections with flanged joints.

H. Embed trench sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

I. Make piping connections and install stainless-steel piping with gasketed joints between system components.

3.13 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, per the details on the drawings. Set with tops at grade elevations noted on the drawings.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.14 TRENCH DRAIN INSTALLATION

A. Install type of drains in locations indicated.

B. The trench drain system shall be installed in accordance with the manufacturer's installation instructions and recommendations.

C. Set drain frames and covers with tops flush with pavement surface.

3.15 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.16 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch thick, brick masonry bulkheads.

2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.

2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

3. Backfill to grade according to Section 310000 "Earthwork."

3.17 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.

2. Place plug in end of incomplete piping at end of day and when work stops.

3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.

2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.

c. Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.

4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION