



McKEE & ASSOCIATES
ARCHITECTS, INC.

Project Manual

A New Gymnasium
at
Appalachian School
for the
Blount County Board of Education
Oneonta, Alabama

Project No: 24.169
September 18, 2024

Alabama Division of Construction Management No. 20240518

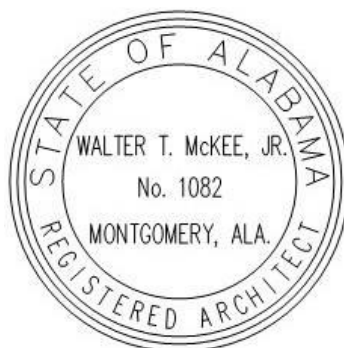


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ADVERTISEMENT FOR BIDS

NEW GYMNASIUM AT APPALACHIAN SCHOOL FOR THE BLOUNT COUNTY BOARD OF EDUCATION ONEONTA, AL

MCKEE PROJECT NO. 24-169

Pre-qualification proposals will be received at the office of McKee and Associates Architects, 631 South Hull Street, Montgomery, AL 36104 until **2:00 PM Central Time, Tuesday, October 1, 2024**. Forms should be emailed to mckeeplans@gmail.com.

Requirements for Pre-qualification: All potential bidders shall contact the Architect at mckeeplans@gmail.com to receive the criteria to be used for the pre-qualification of this project (AIA Document A305 and Questionnaire).

Sealed proposals for this project shall be received by Mr. Rodney Green, Superintendent at Blount County Board of Education Office, 415 5th Avenue East, Oneonta, Alabama 35121, **until 2:00 PM Local Time, Thursday, October 17, 2024**, then opened and read aloud.

All General Contractors bidding on this project shall be required to visit the site and examine all existing conditions prior to submitting their proposal. All Bidders shall have general liability and workman's compensation insurance.

The project shall be bid excluding taxes. Bids must be submitted on proposal forms furnished by the Architect or copies thereof. No bid may be withdrawn after scheduled closing for receipt of bids for a period of ninety (90) days. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owners judgment, the best interests of the Owner will thereby be promoted.

A certified check or Bid Bond payable to **Blount County Schools** in an amount not less than five percent (5%) of the amount of the bid, but in no event more than \$10,000.00 must accompany the bidder's sealed proposal. Performance and statutory labor and material payment bonds will be required at the signing of the Contract.

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. All bidders shall show such evidence by clearly displaying their current license number on the outside of the sealed envelope in which the proposal is delivered.

PDFs of the project can be reviewed by going to the McKee website at www.mckeeassoc.com and selecting "Project Bid List". Also, if you are not receiving NOTIFICATIONS from us, please register on our website, "Project Bid List" by selecting manage your bid list profile. The documents may be viewed on-line and printed by General Contractors, Sub-Contractors and Suppliers. Documents published through this procedure are the only documents endorsed by the Architect. The Architect is unable to monitor, confirm and maintain other websites that provide documents. Addendums will be provided to entities that have *CONFIRMED* bidding for this particular project. The

Armckeeplans@gmail.com. Include your first & last name, company name, address, phone number and the project name and number. Print sets are to be returned, in reusable condition, within ten days after bid opening.

All RFIs and RFAs regarding the bid documents shall be sent and addressed through emails found on the RFI and RFA forms in the project manual. **NOTE: ONLY THE RFI AND RFA FORMS IN THE PROJECT MANUAL WILL BE ACCEPTED.** The Architect will not accept inquiries via telephone or fax.

Completion Time: See scope of work in Project Manual.

Supervision: Contractor to ensure proper supervision of all work.

Owner: Mr. Rodney Green, Superintendent, Blount County Board of Education, 415 5th Avenue East, Oneonta, Alabama 35121 | Phone: (205) 775-1950

Architect: McKee and Associates Architects, Inc., 631 South Hull Street, Montgomery, Alabama 36104 | Phone: (334) 834-9933

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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 should 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 **and date** 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.

REQUEST FOR INFORMATION

(RFI)

Email this form in its entirety to Project Manager listed below.

The Architect reserves the right not to answer any Request For Information received after **2:00 p.m., Two (2) days prior to the bid date.**

To: McKee & Associates, Architects From: _____
Lisa Bowen, Project Manager *Name*
bidrfi@mckeeassoc.com *Company*
Email *Email*

Project: _____ Project Number: _____

Request For Information Number: _____ Issue Date: _____

BID PHASE

CONSTRUCTION PHASE

Procedures for "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 or can be accessed by going to the McKee web site - mckeeassoc.com and clicking on the tab "Files" to retrieve the Addendums.** Neither the Architect nor the Owner 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.**

REQUEST FOR INFORMATION DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHEMENTS: *(List specific documents researched when seeking the information requested.)*

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Drawing Sheet Number: _____ Title: _____
Plan: _____ Elevation: _____ Section: _____ Detail: _____

A New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

REQUEST FOR INFORMATION (RFI)
0000- 1

MCKEE PROJECT NO. 24.169

Other:

RECEIVERS REPLY:

Signed by: _____ Date: _____ Copies to: _____

A New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

REQUEST FOR INFORMATION (RFI)
0000- 2

MCKEE PROJECT NO. 24.169

REQUEST FOR APPROVAL (RFA)
PRIOR APPROVAL/SUBSTITUTION REQUEST

Email this form in its entirety to Project Manager listed below.

All products, materials, systems, equipment and services requested for prior approval must be submitted to the architect for approval **no later than 2:00 p.m., Ten (10) days prior to the bid date.**

To: McKee & Associates, Architects Substitution Request Number: _____
Lisa Bowen From: _____
bowenl@mckeeassoc.com Date: _____
Email

Project: _____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Procedures for “Substitutions” and “Pre-Bid Approval”:

- 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.

The undersigned requests consideration of the following product substitution:

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Supporting Data Attached: Product Description Drawings Photographs Performance & Test Data Specifications

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned states and certifies the following: (Mark Boxes as Applicable)

Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

or

Proposed substitution differs from what is specified in the Bid Documents. Submitted Data clearly identifies all differences from what is specified in the Bid Documents.

No changes will be required to the Contract Documents for the proper installation of the proposed product substitution.

or

Changes will be required to the Contract Documents for the proper installation of the proposed product substitution. Submitted Data clearly identifies description of changes.

and

Warranty will be furnished for proposed substitution Equal to or Superior to specified product.

Proposed substitution does not affect dimensions shown on the drawings and functional clearances.

No changes will be required to the building design, engineering design or detailing by the proposed substitution.

Proposed substitution will have no adverse effect on other trades and will not affect or delay construction progress schedule.

No maintenance is required by the proposed substitution other than that required for originally specified product.

Other Information:

The undersigned further states that they have read the corresponding specification sections in the project manual and confirms that the function, appearance and quality of the proposed substitution are equivalent to or superior to the originally specified product.

Submitted by: (Print)

Signature:

Date:

Firm:

Address:

Email:

Telephone:

A/E REVIEW AND ACTION

Substitution Approved

Substitution Approved as noted

Substitution Rejected

Substitution Request Received to Late

Comments:

Signed by:

Date:

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.

UNIT PRICE ITEM LEGEND

A New Gymnasium
at
Appalachian School
for the
Blount County Board of Education
Oneonta, Alabama

Project No: 24.169

Legal Name of Bidder _____

Mailing Address _____

The General Contractor shall include the Unit Prices below in their Base Bid Proposal. **The quantities assigned below are above and beyond the amounts required to complete the work required by the bid documents.** This Unit Price Item Legend shall be submitted with the sealed Proposal.

SCHEDULE OF UNIT PRICES:

UNIT PRICES: The Unit Prices below establishes Unit Prices so that the Owner can delete/add quantities from the Contract(s) required.

UNIT PRICE #1: The Contractor shall include in his Base Bid proposal the cost for **800** Cubic Yards Measured In Place (CYMIP) of removal and off-site disposal of unsuitable soil and furnishing, placing and compacting of acceptable fill material from below the finished subgrade and tested to meet requirements specified for the affected area, in accordance with Geotechnical Report and Section 02200 "Earthwork."

800 CYMIP @ _____/CYMIP = \$_____ Included in Base Bid

UNIT PRICE #2: The Contractor shall include in his Base Bid proposal **50** Cubic Yards Measured In Place (CYMIP) for excavation of unsuitable soils, disposal off site of excavated material and furnishing and installation of lean concrete mud footing "mud sill" in accordance with the Geotechnical Report and Section 02200 "Earthwork."

50 CYMIP @ _____ per CYMIP = \$_____ Included in Base Bid

Note: This unit price is not applicable to cost of mud footings that are required due to over-excavation, or due to not pouring footings the same date they are excavated, or other reasons indicated in Section 02200 - "Earthwork," or Section 03310 - "Concrete."

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.

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

SPECIAL INSTRUCTIONS TO BIDDERS

1.1 INTENT OF INSTRUCTIONS

- A. The Special Instructions to Bidders are intended to amplify the abbreviated Advertisement and to give other details which shall allow interested parties to prepare bids which accurately reflect the scope of the Work. The Special Instructions to Bidders are meant to be viewed as a complement to the general Instructions to Bidders found in the Project Manual. Should any discrepancy or ambiguity be noted, the Special Instructions to Bidders shall defer to the general Instructions to Bidders.

1.2 EXPLANATION AND INTERPRETATION

- A. Should any Bidder or subcontractor find any ambiguity, discrepancy, omission, or error in the Drawings and Project Manual, or insufficient information to provide a complete job, or be in doubt as to the intent and meaning thereof, he should at once report such in writing to Architect and request clarification prior to bidding
- B. Clarification shall be made only by written Addenda during the bid period and sent to all perspective Bidders. The Architect and Consultants shall not be responsible for verbal answers regarding intent or meaning of the Contract Documents, or for any verbal instructions, by whomsoever made, prior to the award of the Contract.
- C. Additionally, all designed systems and/or assemblies are to be proposed and bid as complete assemblies or operational systems. Drawings are indicating intent and not attempting to fully obtain or detail required work.

1.3 BIDDER REQUIREMENTS

- A. **All Bidders must honor their bid proposals for a period of 90 calendar days from date of bid opening.**
- B. **The Contractor MUST Field Verify all existing conditions prior to submitting bid proposal.**
- C. **The Apparent Low Bidder AND Apparent Second Lowest Bidder** must submit to the **Architect a direct Contact Name, Phone Number and Email Address for the Bonding Company and a list of the principal Subcontractors, suppliers, and fabricators he plans to use for each category of work.** The list of Subcontractors, Suppliers and Fabricators must be received by the Architect within **24 hours following the Bid Opening** (email to: rawlinsonk@mckeeassoc.com). Once the successful bidder has obtained approval from the Owner, no changes in Subcontractors, Suppliers or Fabricators shall be made without the express, written consent of the Owner. Contractor shall request consent in writing from the Owner and Architect and provide specific and reasonable explanation as to the necessity of said change. Should said change be approved by the Owner, the Contractor must submit the desired replacement Subcontractor to the Architect and obtain written approval of the Subcontractor.

1.4 OPENING OF PROPOSALS

- A. The Owner shall, according to applicable laws and regulations pertaining to bid openings, receive and review all Proposals submitted, according to the method selected below:
 - 1. Proposals shall be opened and read publicly at the time and place indicated in the Advertisement.
 - 2. Proposals may be rejected if they contain any omissions, alterations of forms, additions not called for, conditional bids, alternate bids unless called for, incomplete bids, erasures, or irregularities of any kind. Proposals in which the unit or lump sum prices bid are obviously unbalanced may be rejected. Additions to or deductions from the Bid amount may be written on the outside of the sealed bid, or by letter enclosed in the sealed bid envelope.

1.5 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 additional funds become available after the bid opening, the Owner may at his option elect to award to the lowest base bid bidder a contract based on the Contractors base bid amount and additional Alternates.**
- D. 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.
- E. 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.
- F. 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.

1.6 AWARD OF CONTRACT

- A. The Bidder to whom the award is made shall be notified by letter to the address shown on his Proposal at the earliest possible date. At such time, at the option of the Owner, additional information such as a complete financial statement may be required from the successful Bidder.

1.7 EXECUTION OF CONTRACT

- A. The Contract shall be signed by the successful Bidder, in the number of counterparts provided in the Contract Agreement and returned to the Owner with satisfactory Contract Bonds within ten (10) days after the date of Notice of Award.

1.8 PERFORMANCE BOND AND PAYMENT BOND

- A. The intent of the Performance Bond is to ensure the faithful performance of each and every condition, stipulation, and requirements of the Contract and to indemnify and save harmless the Owner, Architect, and Consultants from any and all damages, either directly or indirectly (arising out of any failure to perform same). The successful Bidder to whom the Contract is awarded shall furnish at his expense an acceptable Performance Bond in an amount equal to one hundred percent (100%) of the Contract Price of the Contract as awarded. Said Bond shall be made on the approved Bond form, shall be furnished by a surety company duly authorized and qualified to make such bonds in the State of Alabama, shall be countersigned by an authorized agent resident in the State who is qualified for the execution of such instruments, and shall have attached thereto power of attorney of the signing official. In case of default on the part of the Contractor, all expenses incident to ascertaining and collecting losses suffered by the Owner under the Bond, the direct costs of administration, architectural, engineering, and legal services, shall lie against the Contract Bond for Performance of the Work.
- B. In addition thereto, the successful Bidder to whom the Contract is awarded shall furnish at his expense a Payment Bond with good and sufficient surety payable to the Owner in an amount not less than one hundred percent (100%) of the Contract Price, with the obligation that the Contractor shall promptly make payment to all persons furnishing him or them with labor, material, feedstuffs, or supplies for or in prosecution of the Work provided for in the Contract and for the payment or reasonable attorneys' fees, incurred by successful claimants or plaintiffs in suits on said Bond.

- C. **The Apparent Low Bidder AND Apparent Second Lowest Bidder** must submit to the Architect a direct Contact Name, Phone Number and Email Address for the Bonding Company within 24 hours of the bid opening.

1.9 APPROVAL OF CONTRACT

- A. No Contract is binding upon the Owner until it has been executed by the Owner and the successful Bidder and copies delivered.

1.10 CAD FILES

- A. McKee & Associates CAD Files shall not be provided. Should the contractor require CAD Files they are encouraged to seek online PDF to CAD File Conversion vendors and/or software.

1.11 LIST OF SUBCONTRACTORS

- A. **The Apparent Low Bidder AND Apparent Second Lowest Bidder** must submit to the Architect a direct Contact Name, Phone Number and Email Address for the Bonding Company and a list of the principal Subcontractors, suppliers, and fabricators he plans to use for each category of work must be received by the Architect within twenty-four hours following the Bid Opening. Email to rawlinsonk@mckeeassoc.com. Once the successful bidder has obtained approval from the Owner, no changes in Subcontractors, suppliers and fabricators shall be made without the express, written consent of the Owner.

1.12 LIST OF SUBCONTRACTORS SUBMITTAL FORM

Email this form in its entirety to contact listed below.

A New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

SPECIAL INSTRUCTIONS TO BIDDERS
PAGE-3

The **Apparent Low Bidder AND Apparent Second Lowest Bidder** must submit to the Architect a **direct Contact Name, Phone Number and Email Address for the Bonding Company** and the principal Subcontractors, suppliers, and fabricators he plans to use for each category of work. The list of Subcontractors must be received by the Architect within twenty-four hours following the Bid Opening.

To: McKee & Associates, Architects
Kayla Rawlinson
rawlinsonk@mckeeassoc.com
Email

From: _____
Company

Name

Email

Phone Number

Project Name: _____

Project Number: _____

Issue Date: _____

Bid Date: _____

Category of Work	Name of Sub to Perform Work	Name of Supplier
SURETY		

END OF SECTION

**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

<p align="center">CONSTRUCTION CONTRACT - DCM Form C-5 or DCM Form 9-A (PSCA Projects)</p> <p>Three 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.</p>	
(1)	<p>PROJECT NUMBER(S): Insert the DCM (BC) Project Number in the block provided.</p> <ul style="list-style-type: none"> On DCM Form 9-A, also insert the PSCA Project Number in the block provided.
(2)	<p>DATE: Insert the date upon which the Contractor will sign the contract.</p>
(3)	<p>OWNER: Insert the full, legal name, address, email, and telephone number of the Owner (Awarding Authority).</p> <ul style="list-style-type: none"> 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)	<p>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.</p> <ul style="list-style-type: none"> 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)	<p>The WORK: Insert the complete name of the Project; same as in the Bid Documents.</p>
(6)	<p>CONTRACT DOCUMENTS: Insert the date of the Bid Documents</p>
(7)	<p>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.</p>
(8)	<p>ARCHITECT: Insert the full, legal name, address, email, and telephone number of the Project Architectural or Engineering firm.</p>
(9)	<p>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.</p>
(10)	<p>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.</p>
(11)	<p>The CONTRACT TIME: State the Contract Time in words and in figures.</p>
(12)	<p>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.</p>
(13)	<p>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.</p> <ul style="list-style-type: none"> 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)	<p>STATE GENERAL CONTRACTOR'S LICENSE: Insert the Contractor's current state general contracting license number, bid limit, and classification in the spaces provided.</p>

(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.
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**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 <u>must</u> 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.

This form is provided solely for the purpose of inclusion in the project manual. A Construction Contract for fully locally-funded K-12 projects must be initiated via the appropriate DocuSign link from DCM's webpage https://dcm.alabama.gov/forms_publicK12.aspx by the Lead Design Professional Firm.

DCM (BC) Project No.

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

CONSTRUCTION CONTRACT

- (1) This Construction Contract is entered into this _____ day of _____ in the year of _____
- (2) between the **OWNER**,
Entity Name: _____
Address: _____
Email & Phone #: _____
- (3) and the **CONTRACTOR**,
Company Name: _____
Address: _____
Email & Phone #: _____
- (4) for the **WORK** of the Project, identified as: _____
- (5) The **CONTRACT DOCUMENTS** are dated _____ and have been amended by _____
- (6) **ADDENDA** _____
- (7) The **ARCHITECT** is _____
Firm Name: _____
Address: _____
Email & Phone #: _____
- (8) The **CONTRACT SUM** is _____ Dollars (\$ _____) and is the sum of the Contractor's Base Bid for the Work and the following
- (9) **BID ALTERNATE PRICES:** _____
- (10) 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 by the Lead Design Professional on the Owner's behalf), and shall then be substantially completed within the Contract Time.

- (11) **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** *(Insert any Special Provisions 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.

<p>(15) APPROVAL</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>ALABAMA STATE DEPARTMENT OF EDUCATION (SDE) <i>(Required for locally-funded, SDE projects.)</i></p> <p>By _____ Date: _____ State Superintendent of Education</p> </div>	<p style="text-align: center;">CONTRACTING PARTIES</p> <div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <p style="text-align: center;">_____ Contractor Company</p> <p>By _____ Signature</p> <p>Name & Title _____</p> </div> <div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">_____ Owner Entity</p> <p>By _____ Signature</p> <p>Name(s) & Title(s) _____</p> </div>
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Routing of the Construction Contract to reviewers and e-signers is automated through DocuSign. DocuSign links for fully locally-funded contract documents are available from DCM's webpage https://dcm.alabama.gov/forms_publicK12.aspx.

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:

<u>Coverage</u>	<u>Limit</u>
.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 OR COMMERCIAL EXCESS LIABILITY INSURANCE

(a) Commercial Umbrella or Commercial Excess 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 Umbrella or Commercial Excess Limits of:

- .1 \$ 5,000,000 per Occurrence
- .2 \$ 5,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella or Commercial Excess 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.”

Exception: projects containing only abatement and/or only demolition do not require Builder's Risk insurance, unless required by the Owner. Note: projects containing any scope of work besides abatement and/or demolition require Builder's Risk insurance.

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 or Excess 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.

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.

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

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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) substitutions 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 phrases 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 \$100,000):**

(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 of \$100,000 or more):

(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 hardcopy 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. CERTIFICATE of SUBSTANTIAL COMPLETION

(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 less than \$100,000:** Advertisement for Completion shall not apply to contractors performing contracts of less than \$100,000.00 in amount. §39-1-1(g)

(2) **If the Contract Sum is \$100,000 or more:** 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 three weeks. **The contractor can publish a notice in one or more of the following ways:**

- (a) In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.
- (b) On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.
- (c) On a website utilized by the awarding authority for publishing notices.
- (d) If no newspaper is published in the county in which the work was done, and if the awarding authority does not utilize a website for the purpose of publishing notices, the notice may be given by posting at the courthouse for 30 days, and proof of the posting of the notice shall be given by the awarding authority and the contractor.

Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher or website owner and a printed copy of the notice published. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice.

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:

<u>Coverage</u>	<u>Limit</u>
.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 OR COMMERCIAL EXCESS LIABILITY INSURANCE**
- (a) Commercial Umbrella or Commercial Excess 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 Umbrella or Commercial Excess Limits of:
- .1 \$ 5,000,000 per Occurrence
 - .2 \$ 5,000,000 Aggregate
- (c) Additional Requirements for Commercial Umbrella or Commercial Excess 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."

Exception: projects containing only abatement and/or only demolition do not require Builder's Risk insurance, unless required by the Owner. Note: projects containing any scope of work besides abatement and/or demolition require Builder's Risk insurance.

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 or Excess 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 \$100,000, 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 TRADE 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.

EE. ALABAMA ECONOMIC BOYCOTT LAW

In compliance with Ala. Act No. 2023-409, by signing this contract, the contracting parties provide written verification that they, without violating controlling law or regulation, do not and will not, during the term of the contract engage in economic boycotts as the term “economic boycott” is defined in Section 1 of the Act. This requirement applies to contracts entered into on or after October 1, 2023 if a contracting party employs 10 or more employees and the contract could exceed \$15,000 over the term of the contract. Under Section 2 of the Act, the written verification may be waived if the contracting governmental entity determines based on cost and quality factors that such a waiver is clearly in the best interest of the public.

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 **iron or steel, that are made a permanent part of the structure**, produced in the United States if the Contract Documents require the use of **iron or 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

SUPPLEMENT TO THE GENERAL CONDITIONS OF THE CONTRACT

1.1 The following supplements shall modify, delete and/or add to the General Conditions of the Contract. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided or superseded shall remain in effect.

A. Refer to Article 2.A; Definition:

1. Architect: Construction documents for this project have been developed by **McKee and Associates, Architects**, 631 South Hull Street, Montgomery, Alabama, 36104, (334) 834-9933 `commissioned by the Owner.
2. Owner: **Blount County Board of Education**. Unless otherwise stated, all papers required to be delivered to the Owner shall be forwarded through the Architect.

B. Refer to Article 3:

1. Add the following:
 - a. **Contractor's Qualification's:** The Roofing Contract shall possess the following, or stringent, minimum qualifications: the roofing contractor must be a firm of not less than five (5) years of successful experience in installation of roof systems similar to those specified for the project and which is acceptable to or licensed by the manufacturer of the primary roofing materials.
 - b. **Manufacturer's Qualifications:** In specifying acceptable manufacturers or minimum quality qualifications of manufacturers, the following, or more stringent criteria should be used: The manufacturer shall have a minimum of five (5) years of experience in the manufacture of the roofing system and must also be the **original material manufacturer** of the primary roofing material.

C. Refer to Article 6;

1. Add the following to Paragraph B:
 - a. The lowest bidding Contractor shall submit to the Architect within five (5) calendar days after the bid date the name(s) of the Superintendent(s) who will be in charge at the work site, along with the qualifications and experience.
 - b. NOTE: By submission of a Proposal the Bidder agrees that the Owner or Architect may reject a proposed Superintendent with or without a stated reason with no recourse to the Contractor.

D. Refer to Article 6;

1. Add the following to Paragraph C:
 - a. All labor shall be performed in the best and most workmanlike manner by persons skilled in their respective assignments or trades. Workmen whose work is unsatisfactory to the Architect or the Owner, or who are considered unfit or unskilled, or otherwise objectionable, shall be dismissed upon notice from the Architect or Owner.

E. Refer to Article 9, Paragraph D;

1. Add the following:
 - a. All submittals for color selections, to be made by the Architect for the entire project shall be submitted at the same time within 45 days from the "Notice to Proceed". Piece-meal submittals for color selection will not be permitted.
 - b. Provide as follows unless otherwise specified:

- 1) All submittals shall be sent to the Architect no later than 45 calendar days from "Notice To Proceed" to: submittals@mckeeassoc.com or Submittal Exchange if applicable.
- 2) Submittals regarding mechanical, plumbing, electrical and structural items shall be sent directly to the Engineer of record (see cover sheet of the specification for address). A digital copy of the transmittal shall be sent to the Architect at the following email address: submittals@mckeeassoc.com or Submittal Exchange if applicable.

F. **Refer to Article 13;**

1. Add the following:
 - a. "If the bidder desires to substitute an "equal", he must secure written approval by the Architect of qualification to bid ten (10) days prior to date.
 - b. On all items specified as or equal substitutions must be submitted to the Architect ten (10) days prior to bid opening and Architect will act on substitution five (5) days prior to bids and notify all Contractors.
 - c. The request for substitutions are to be filled out completely and must be received prior to bid. Any subcontractor and/or material supplier that was not "approved" and their price is used at bid time will be the Contractors problem to absorb any cost associated with the use of a "non-approved material or equipment. If the "approval" is not listed in the addendum, then the "approval" is not accepted.

G. **Refer to Article 15:**

1. The General Contractor shall be solely responsible for all requirements under this Article.

H. **Refer to Article 16:**

2. Add the following: Article 16; General, (5)
 - a. **Single-Ply Roofs:** Should design or economic restrictions require the use of a single-ply elastomeric roofing system, ballasted systems of any type should be avoided.
 - b. **Interior Gutters:** The use of interior gutters should be avoided at all times.
 - c. **Protection During Application:** At no time during construction should the surface of the asphalt or coal tar pitch roofing system to be left unprotected. A glaze coat of asphalt or pitch must be applied to the surface of the membrane if the top pour or cap sheet cannot be applied during the same day.
 - d. **Contractor's Qualification's:** The Roofing Contract shall possess the following, or stringent, minimum qualifications: the roofing contractor must be a firm of not less than five (5) years of successful experience in installation of roof systems similar to those specified for the project and which is acceptable to or licensed by the manufacturer of the primary roofing materials.
 - e. **Manufacturer's Qualifications:** In specifying acceptable manufacturers or minimum quality qualifications of manufacturers, the following, or more stringent criteria should be used: The manufacturer shall have a minimum of five (5) years of experience in the manufacture of the roofing system and must also be the **original material manufacturer** of the primary roofing material.

I. **Refer to Article 29, PROGRESS PAYMENTS, paragraph "B", Schedule of Values:**

1. Amend Paragraph as follows:
 - a. "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 'and category of Work with Subcontractor name(s)' of the various parts of the Work for billing purposes."
2. Add the following:

- a. The Contractor shall list the Category of Work with the Subcontractor name(s) attributable to each line item value in the column "B", "Description of Work" line(s) of the DCM Form C-10SOV, Schedule of Values.
3. Add the following:
 - a. Values shall be broken down within principal contracts in amounts not greater than \$30,000, but in no case greater than 5 percent of the Contract Sum.
- J. **Refer to Article 32, SUBSTANTIAL COMPLETION**
1. Add the following:
 - a. All manufacturers' warranties shall commence on the date as set forth on the Substantial Completion Form, no exceptions.
 - b. Contractor shall furnish to the Architect a written letter of "notification" that all "Punch List" items have been completed prior to re-inspection.
- K. **Refer to Article 35**, paragraph "D", Special Warranties:
1. Change as follows:
 - a. 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.
- L. **Refer to Article 37**:
1. The Architect shall not be liable for any damage or injury to property or any person or persons arising from the presence of/or effects of any hazardous materials or hazardous elements in any state of form in connection with the work under this Contract. All such liability shall lie with the Contractor.
- M. **Refer to Article 44**:
1. Add the following: All work on this project shall be performed in accordance with the following codes:
 - a. 2010 ADA Standards For Accessible Design
 - b. 2021 International Building Code
 - c. 2021 International Plumbing Code
 - d. 2021 International Mechanical Code
 - e. 2021 International Fuel Gas Code
 - f. 2021 International Fire Code
 - g. 2020 National Electrical Code
 - h. 2019 National Fire Alarm and Signaling Code
 - i. ANSI/ASHRAE/IESNA Standard 90.1-2013 Energy Standard for Buildings Except Low-Rise Residential
- N. **Refer to Article 49**:
1. Liquidated damages will be assessed at a rate of 6% per annum.
 2. If this contract extends thirty (30) days past Schedule Completion Date, Owner shall deduct from the Contractor's final payment, a sum equal to the additional expense incurred by the Owner for the Architect for contract administration past scheduled completion date.

END OF SECTION



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.



Kay Ivey
Governor

Bill Poole
Director of Finance

STATE OF ALABAMA
DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management

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Mickey Allen
Assistant Finance Director
Real Property Management

Frank Barnes, Director
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E-Verify Memorandum of Understanding

Instructions for inclusion in project manuals.

Per DCM's May 29, 2012 bulletin *Guidance on Act 2012-491 Amending the Alabama Immigration Law*: "Contractors (including architects and engineers) will ... be required to enroll in the E-Verify program and to provide documentation of enrollment in the E-Verify program with their contracts or agreements."

Upon completing enrollment in the E-Verify program available at <https://www.e-verify.gov/employers/enrolling-in-e-verify>, an E-Verify Memorandum of Understanding (MOU) is issued to the enrolled business. The same E-Verify MOU can be repeatedly used until any information in the business's E-Verify user profile is updated, at which time E-Verify updates the printable Company Information section of the MOU, while the original signatory information remains the same. Typically, an E-Verify MOU is 13-18 pages long depending on business type and number of employees.

DCM requires a copy of the entire current E-Verify MOU document including the completed Department of Homeland Security – Verification Division section (with name, signature and date included) to be submitted as an attachment to each Construction Contract original and to each Agreement Between Owner and Architect original.



November 2023

E-Verify Memorandum of Understanding

Contractors (including architects and engineers) will be required to enroll in the E-Verify program and to provide documentation of enrollment in the E-Verify program with their contracts or agreements per Alabama Immigration Law.

McKee and Associates Architects requires a copy of the entire current E-Verify MOU document including the completed Department of Homeland Security – Verification Division section (with name, signature and date included) to be submitted as an attachment to each Construction Contract original and to each Agreement Between Owner and Architect original.

Refer to State of Alabama E-Verify Memorandum of Understanding Instructions (Revised August 2021) with ABC Bulletin (May 29, 2012) and Revised Alabama Immigration Law Guidance for School Boards (Revised May 2012).



ALABAMA DEPARTMENT OF REVENUE
SALES AND USE TAX DIVISION
P.O. Box 327710 • Montgomery, AL 36132-7710

ST: EXC-01
6/21

Application For Sales and Use Tax Certificate of Exemption

FOR GOVERNMENT ENTITY PROJECT

This Certificate of Exemption will be limited to purchases which qualify for an exemption of sales and use taxes pursuant to Rule No. 810-6-3-.77

PROJECT INFORMATION:

PROJECT NAME		PROJECT OWNER'S FEIN (EXEMPT ENTITY)	
STREET ADDRESS OF PROJECT (CITY AND COUNTY INCLUDED)	CITY	ZIP	COUNTY

APPLICANT'S INFORMATION:

RELATION: (CHOOSE ONE)

Government Entity General Contractor Subcontractor

APPLICANT'S LEGAL NAME	FEIN			
DBA	CONSUMER'S USE TAX ACCOUNT NUMBER			
MAILING ADDRESS: STREET	CITY	STATE	ZIP	COUNTY
CONTACT PERSON	BUSINESS TELEPHONE NUMBER ()			
EMAIL ADDRESS				

CONTRACT SIGN DATE (PROVIDED BY GENERAL CONTRACTOR)	CONTRACT COMPLETION DATE (PROVIDED BY GENERAL CONTRACTOR)
ESTIMATED START DATE (FOR APPLICANT)	ESTIMATED COMPLETION DATE (FOR APPLICANT)
WILL THE APPLICANT HAVE ANY SUBCONTRACTORS ON THIS JOB? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, please attach list.	NAME OF PARTY TO THE CONTRACT

JOB DESCRIPTION

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE? <input type="checkbox"/> Yes <input type="checkbox"/> No	ESTIMATED POLLUTION CONTROL COST \$	
TOTAL PROJECT BID AMOUNT (APPLICANT'S PORTION OF PROJECT) \$	LABOR COST (APPLICANT'S PORTION OF PROJECT) \$	MATERIAL COST (APPLICANT'S PORTION OF PROJECT) \$

REVENUE DEPARTMENT USE ONLY

PENDING DOCUMENTATION / INFORMATION:

GCL SBL Contract / NTP / LOI LOS Contract Dates / Breakdown of Costs

Contact Dates: _____ Received Date: _____

Forwarded for Denial: _____

PROJECT NAME

PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

Individual Partnership Corporation Multi member LLC Single member LLC Government Entity

If applicant is a corporation, a copy of the certified certificate of incorporation, amended certificate of incorporation, certificate of authority, or articles of incorporation should be attached. If the applicant is a limited liability company or a limited liability partnership, a copy of the certified articles of organization should be attached.

OWNERSHIP INFORMATION:

Corporations – give name, title, home address, and Social Security Number of each officer.

Partnerships – give name, home address, Social Security Number or FEIN of each partner.

Sole Proprietorships – give name, home address, Social Security Number of owner.

LLC – give name, home address, and Social Security Number or FEIN of each member.

LLP – give name, home address, and Social Security Number or FEIN of each partner.

NAME (PLEASE PRINT)

SIGNATURE

TITLE

DATE

REVENUE DEPARTMENT USE ONLY

PENDING OTHER:

Government Entity General Contractor Not on LOS

Contact Dates: _____ Received Date: _____

Forwarded for Denial: _____

Examiner's Remarks _____

Examiner _____ Date _____

Instructions For Preparation of Form ST: EXC-01

Sales and Use Tax Certificate of Exemption for Government Entity Project

NOTE: Exemption Certificates will be issued as of the contract sign date or the received date of the application. If, upon receipt of the application, the project has already commenced, the certificate will be issued as of the received date of the application. Any purchases made prior to the issuance of a certificate will not be exempt.

***** Please allow 10 to 14 business days for your application to be processed. *****

In order to expedite the processing of your application, please include the following documentation when submitting your application:

Exempt Entity:

1. Signed Application
2. Copy of Executed/Signed Contract, Letter of Intent, Notice of Award, and/or Notice to Proceed

General Contractor:

1. Signed Application
2. Copy of Executed/Signed Contract, Letter of Intent, Notice of Award, and/or Notice to Proceed
3. List of Subcontractors
4. Alabama Board of General Contractor's License
5. State/County Business License (usually obtained through county probate office)
6. Any other municipal business licenses associated with the project

Subcontractor:

1. Signed Application
2. Alabama Board of General Contractor's License
3. State/County Business License (usually obtained through county probate office)
4. Any other municipal business licenses associated with the project
5. List of Subcontractors (if any)

General contractors and subcontractors:

- Any additions and/or deletions to the list of subcontractors working on a project must be submitted to the Department within 30 days of occurrence.
- If an extension is needed for a project, please contact the Department of Revenue at the address, number, or email listed below. Extension requests should be submitted no more than 30 days after expiration date.
- Subcontractor's Estimated Start Date should be the date they will begin working on the project and ordering materials instead of the General Contractor's Estimated Start Date for the project.

THERE IS A FILING REQUIREMENT IF YOUR APPLICATION IS APPROVED. The return will be filed through the Consumer's Use Tax account. Please see the following page for detailed instructions and general information regarding the reporting requirements.

The application and required documentation may be mailed, faxed, or emailed to the following:

Fax: (334) 353-7867

Email: STExemptionUnit@revenue.alabama.gov

Mailing Address: ATTN: Contractor's Exemption
Alabama Department of Revenue
Sales & Use Tax Division
Room 4303
PO Box 327710
Montgomery, AL 36132-7710

General Information and Instructions Regarding the Reporting Requirements for Contractors Awarded an Exemption Certificate

A contractor's exemption certificate for a Government Entity project is needed in order to purchase materials tax exempt for the qualified project. Once the exemption certificate has been applied for and awarded, there is a monthly filing requirement to report the purchases that have been made for each exempt project. The Consumer's Use (CNU) tax account is used to report the tax-exempt purchases made with each certificate for each exempt project for each month.

The consumer's use tax return must be filed for each of the months covered by the exemption certificate. (For example, if the certificate's effective date is June 29, 2014 and the expected completion date is October 1, 2014, a consumer's use tax return must be filed for each of the following months: June, July, August, September, and October.) A return MUST be filed each month to report the monthly purchases. Therefore, all active exemption certificates must be included on the monthly report even if the monthly purchases for a specific project was \$0.

If a CNU tax account is not already open under the taxpayer/business name, one will automatically be assigned at the time the exemption certificate is generated. Electronic filing is required through the Department's online filing system, My Alabama Taxes (MAT). A letter containing the online filing information will be mailed to the address on file within a few days after the new CNU tax account has been assigned. This letter will contain all the information needed to create your online filing account in MAT. For questions relating to setting up the account on www.myalabamataxes.alabama.gov, please contact Business Registration at 334-242-1584 or the Sales Tax Division at 1-866-576-6531.

Once the MAT account is set up, please log in and file the monthly CNU tax return. There is a table located at the bottom left hand corner labeled "Contractor's Exemption for Government Construction Projects." All three fields in the table are required to be completed: exemption number, project number, and total amount of purchases for that specific project for the month. Additional projects may be added on the additional rows that appear as data is added; the table will allow the addition of more projects.

***Please do not use lines 1 through 9 of the return for reporting exempt project information. Leave these lines blank unless taxable purchases were made outside of the state of Alabama that need to be reported and tax remitted. (Lines 1 through 9 do not have anything to do with the exemption reporting requirements).

When the certificate expires (upon the project's completion) and the CNU tax account is no longer needed, please contact the Business Registration Unit at 334-242-1584 and close the CNU tax account. Please be advised that if there are multiple government entity projects open, the consumer's use tax account should remain open until the last project completion date. For example, if Project EXC00ABCD ends in June of 2014 but Project EXC00EFGH ends January of 2015, the CNU tax account must remain open until the end of January 2015. A return for Project EXC00EFGH must be filed all the way through January 2015.

If the applicant already has a CNU tax account and it is currently set up online, please use this account to report exempt project purchases through www.myalabamataxes.alabama.gov using the instructions provided above. The return may then be filed as usual.

***All Consumer's Use Tax returns are due on the 20th of the month following the month in which purchases were made (i.e., the return for the month of June is due July 20th, etc. There are 20 days to file the return before it is deemed late.)

***Any penalty waiver requests may be directed to the Sales and Use Tax Division at 1-866-576-6531. Only one waiver per 18 month period is allowed.



ALABAMA DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management

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

Revised December 2021

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.

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 All State Agency, PSCA-funded University, and PSCA-funded K-12 projects: payment applications must be submitted via DocuSign PowerForm links available from DCM's website. Fully locally-funded University and fully locally-funded K-12 projects: submit payment applications per Owner requirements.
	10. Change Orders - Documentation - no prior work, unless authorized in writing All State Agency, public K-12, and PSCA-funded projects: change orders must be submitted via DocuSign PowerForm links available from DCM's website. Fully locally-funded University projects: submit change orders per Owner requirements.
	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@rpm@rpm.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. <u>Pre-Construction Conference: Required Attendees: Contractor, Owner, Architect, Major Subs</u> <ul style="list-style-type: none"> • Fully-executed construction contract and Notice to Proceed • Verification of permit fee payment (Exception: fully locally-funded K-12 & public four-year University capital improvement, HVAC, or roof projects with both an estimated cost of \$750,000.00 or Less, and a contract awarded on or after 10/01/22, are exempt from DCM Fees.) • Owner's statement of responsibility (storm shelter) • 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

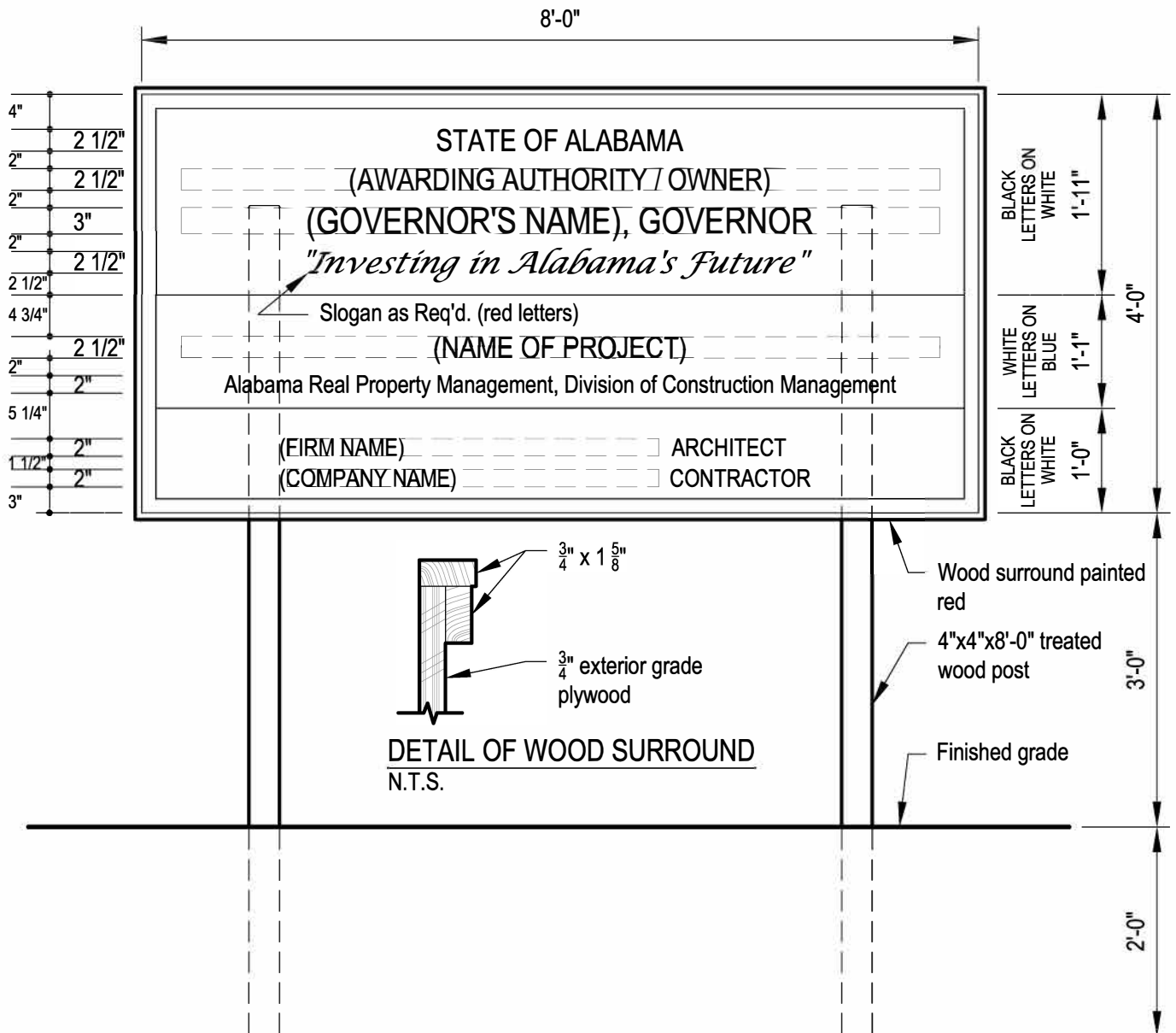
	<p>13. <u>Pre-Construction Conference for Storm Shelter</u>: Required Attendees: Contractor, Owner, Architect, Structural Engineer, Major Subs, Special Inspections Representative</p> <ul style="list-style-type: none"> • The completed & signed DCM Form B-15: Owner's Statement of Responsibility for Tornado Storm Shelter (Hurricane Shelter Where Applicable) must be submitted to the DCM Inspector at Pre-Construction Conference. • The completed & signed DCM Form C-17: Contractor's Statement of Responsibility for Construction of Tornado Storm Shelter (Hurricane Shelter Where Applicable) along with required Quality Assurance Plan (QAP) must be submitted to DCM Inspector at Pre-Construction Conference. <p><u>Pre-Roofing Conference</u>: Required Attendees: Contractor, Owner, Architect, Roofing Sub, Roofing Manufacturer's Representative</p> <ul style="list-style-type: none"> • 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. <p><u>Above Ceiling Inspections</u>: Required Attendees: Contractor, Owner, Architect, MEP Engineers, Major Subs</p> <ul style="list-style-type: none"> • 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 <p><u>Life Safety Inspections and Final Inspection</u>: Required Attendees: Contractor, Owner, Architect, Engineers, Major Subs, Local Fire Marshal</p> <ul style="list-style-type: none"> • 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 <p><u>Year-End Inspection</u>: Required Attendees: Contractor, Owner, Architect, Engineers and/or Major Subs may be required</p> <ul style="list-style-type: none"> • Owner's list of documented warranty items • Reconciliation of user fees with DCM shall be completed prior to inspection
	<p>14. Other inspections required before work is covered</p>
	<p>15. Inspection report distribution – weekly per Owner-Architect Agreement</p>
	<p>16. Record Drawings, definition of, procedures, addenda posted, etc.</p>
	<p>*17. Project sign and other job signs</p>
	<p>18. Point of contact for project. Job Superintendent and phone number.</p>
	<p>*19. Overall phasing of job</p>
	<p>20. Contractor's duty to coordinate work of separate contractors</p>

	*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 for all projects via DocuSign PowerForm links available from DCM's website.
	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 All projects: Certificate must be activated via DocuSign PowerForm links after final inspection and receipt of DCM Inspector's report. DocuSign PowerForm links are available from DCM's website.
	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 <ul style="list-style-type: none"> a. Contractor's Statement of Responsibility and Quality Assurance Plan – Provide paperwork at Pre-Construction Conference. Must be kept with Owner's storm shelter records. b. Certification of Structural Observations from the Structural Engineer of Record must be attached to the Certificate of Substantial Completion form via DocuSign. c. Owner's Statement of Responsibility for Tornado Storm Shelter (Hurricane Shelter Where Applicable) - Provide paperwork at Pre-Construction Conference. Must be kept with Owner's storm shelter records.
	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 <ul style="list-style-type: none"> a. Warranties b. Operating and Maintenance Manuals c. As-built Drawings d. Other requirements
	67. Advertisement of Completion - start ad after substantial completion <ul style="list-style-type: none"> a. for projects less than \$100,000.00, Advertisement of Completion is not required. b. for projects \$100,000.00 or more, Contractor advertises for 3 weeks. The contractor can publish a notice in one or more of the following ways: <ul style="list-style-type: none"> • In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done. • On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done. • On a website utilized by the awarding authority for publishing notices. • If no newspaper is published in the county in which the work was done, and if the awarding authority does not utilize a website for the purpose of publishing notices, the notice may be given by posting at the courthouse for 30 days, and proof of the posting of the notice shall be given by the awarding authority and the contractor.
	68. Time Extensions
	69. Final Payment Application checklist

DETAIL OF PROJECT SIGN

N.T.S.



Notes:

1. Fully locally-funded State Agency and Public University projects: DCM Form C-15 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.
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 in the project manual.
Partially or fully PSCA-funded projects: DCM Form C-15 must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of 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. Exception: Alabama Community College System (ACCS) PSCA-funded projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.
Fully locally-funded ACCS projects with Notice-To-Proceeds issued prior to August 1, 2021: DCM Form C-15 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.
2. Sign to be constructed of 3/4" exterior grade plywood.
3. Paint with two coats best grade exterior paint before letters are painted. Option: In lieu of painted lettering on plywood, a corrugated plastic sign (displaying the same lettering, layout and colors as above) may be secured directly to the unpainted exterior grade plywood.
4. Sign shall be placed in a prominent location and easily readable from existing street or roadway.
5. Sign shall be maintained in good condition until project completion.
6. Slogan: Act 2020-167's title "Investing In Alabama's Future" should be placed on the project signs 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.

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 <i>(Form C-10SOV's Column F Total)</i>	\$ _____
2. Materials Presently Stored <i>(When this amount is greater than \$0.00, attach Form C-10SM: Inventory of Stored Materials, or similar list)</i>	+ \$ _____
3. Total Work Completed to Date & Materials Presently Stored (<u> </u> % of Contract To Date)	\$ _____
4. Less Retainage <i>(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.)</i>	- \$ _____
5. Total Due	\$ _____
6. Less Total Previous Payments Billed <i>(Must exactly match #5 Total Due from previous payment application. # 6 is \$0.00 if there is no previous payment application)</i>	- \$ _____
7. Balance Due This Estimate	\$ _____

Final pay app? Yes.

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 _____
 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 _____

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		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)	
			Work Previously Completed (Previous pay app SOV's column F. D is \$0 if this SOV is for first pay app.)	Work Completed This Period (Period as noted above)						
1.					\$ -		\$ -		Retainage Variable Rate: 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. Once H exceeds 50% of C and up until project is complete, Retainage = C x 0.025. There will be no retainage on final payment application.	
2.					\$ -		\$ -			
3.					\$ -		\$ -			
4.					\$ -		\$ -			
5.					\$ -		\$ -			
6.					\$ -		\$ -			
7.					\$ -		\$ -			
8.					\$ -		\$ -			
9.					\$ -		\$ -			
10.					\$ -		\$ -			
11.					\$ -		\$ -			
12.					\$ -		\$ -			
13.					\$ -		\$ -			
14.					\$ -		\$ -			
15.					\$ -		\$ -			
16.					\$ -		\$ -			
17.					\$ -		\$ -			
18.					\$ -		\$ -			
19.					\$ -		\$ -			
20.					\$ -		\$ -			
21.					\$ -		\$ -			
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.

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 Description	B Materials Stored Last Period	C Materials Purchased This Period <small>(period noted above)</small>	D Materials Used This Period <small>(period noted above)</small>	E Materials Presently Stored <small>(B + C - D)</small>
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.

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.:							ARCHITECT/ENGINEER:			
PROJECT:										

WORK DIVISION		%	AMOUNT												
1.	GENERAL REQUIREMENTS														
2.	SITWORK														
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

**Alabama Department of Finance
Real Property Management
Division of Construction Management**

770 Washington Avenue, Suite 444
Montgomery, Alabama 36104
(334) 242-4082 (phone)

**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.

This form is provided solely for the purpose of inclusion in the project manual. A Construction Contract for fully locally-funded K-12 projects must be initiated via the appropriate DocuSign link from DCM's webpage https://dcm.alabama.gov/forms_publicK12.aspx by the Lead Design Professional Firm.

DCM Form C-12 (fully locally-funded K-12 school project)
June 2023

A Change Order is not valid without an accompanying completed Change Order Justification (DCM Form B-11).

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; only use an attachment if fields below become full.)*:

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 _____

Routing of the Construction Contract to reviewers and e-signers is automated through DocuSign. DocuSign links for fully locally-funded contract documents are available from DCM's webpage https://dcm.alabama.gov/forms_publicK12.aspx.

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

Change Order No. _____

Date: _____

DCM (BC) No. _____

*Purpose and instructions on next page.
Do not staple this form and/or attachments; use clips.*

(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: <input type="checkbox"/> ADD <input type="checkbox"/> 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 _____ ARCHITECTURAL / ENGINEERING FIRM NAME By: _____ ARCHITECT / ENGINEER'S SIGNATURE By: _____ OWNER'S PROJECT REPRESENTATIVE'S SIGNATURE	CHANGE ORDER JUSTIFIED AND APPROVED _____ LOCAL OWNER ENTITY NAME By: _____ OWNER'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.**

GENERAL CONTRACTOR'S ROOFING GUARANTEE

DCM 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

TO: **Alabama Department of Finance**
Real Property Management
Division of Construction Management
 770 Washington Avenue, Suite 444
 Montgomery, AL 36130-1150
 (334) 242-4082

DCM Form C-13
 Revised November 2022;
 (Note: Use DCM Form C-13A for fully locally-funded K-12 & Public 4-
 Year University Capital Improvement, HVAC, & Roof Projects with both a
 total cost of \$750,000 or Less and a contract awarded on or after 10/01/22)

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: Email to receive executed copy: _____	ARCHITECTURAL / ENGINEERING FIRM NAME AND ADDRESS: Email to receive executed copy: _____
CONTRACTOR COMPANY NAME AND ADDRESS: Email to receive executed copy: _____	BONDING COMPANY NAME AND ADDRESS: 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 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.

RECOMMENDED BY <i>(signature and email address required):</i>	
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.

Also, any 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.

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. If all PSCA funds are expended prior to Final Payment, it is not a requirement to submit the Application & Certificate for Final Payment along with the supporting documentation to DCM.

(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. _____ <small>(If applicable)</small>
-----------------	--

YES	N/A	Select "YES" or "N/A" as applicable.
<input type="checkbox"/>	<input type="checkbox"/>	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.
<input type="checkbox"/>		Certificate of Substantial Completion, DCM Form C-13: Attach one fully-executed copy to FPC.
<input type="checkbox"/>		Advertisement for Completion, DCM Form C-14: Attach one copy of the affidavit of publication (including the advertisement) to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's Affidavit of Payment of Debts & Claims, DCM Form C-18: Attach one copy to FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's Affidavit of Release of Liens, if required by Owner, DCM Form C-19: Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	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.
<input type="checkbox"/>	<input type="checkbox"/>	General Contractor's Roofing Guarantee, DCM Form C-9, and Other Specified Roofing Guarantees, if any: Attached to Certificate of Substantial Completion.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's One-Year Warranty: Original has been delivered to the Owner. Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Other Warranties: All other specified original warranties has been delivered to the Owner. Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Record Documents: Specified "As-built" plans and specifications have been delivered to the Owner.
<input type="checkbox"/>		O & M Manuals: Specified instructions and O&M Manuals have been delivered to the Owner.
<input type="checkbox"/>	<input type="checkbox"/>	Time Extension: Over-run of Contract Time has been reconciled by: <input type="checkbox"/> Change Order <input type="checkbox"/> Liquidated Damages <input type="checkbox"/> Attached explanation
<input type="checkbox"/>	<input type="checkbox"/>	Additional Documents or Explanations which are attached:

Submitted By:	_____ Architectural / Engineering Firm
_____	_____
<small>Signature</small>	<small>Printed Name and Title</small>
_____	_____
	<small>Date</small>

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.

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Payment of Debts and Claims

To Owner (<i>Entity name and address</i>):	Project (<i>Same as appears in the Construction Contract</i>):
---	---

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 (<i>Entity name and address</i>):	Project (<i>Same as appears in the Construction Contract</i>):
---	---

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 (<i>Entity name and address</i>): 	Project (<i>Same as appears in the Construction Contract</i>):
---	---

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.

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 for a minimum of three weeks for projects of \$100,000.00 or more. For acceptable methods of advertisement, see General Conditions of the Contract, Article 34. Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher or website owner and a printed copy of the notice published. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice.



**STATE OF ALABAMA
DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management**



Kay Ivey
Governor

Kelly Butler
Director of Finance

P.O. Box 301150, Montgomery, AL 36130-1150
770 Washington Avenue, Suite 444, Montgomery, AL 36104
Telephone: (334) 242-4082 Fax: (334) 242-4182

Mickey Allen
Assistant Finance Director
Real Property Management

Frank Barnes, Director
Construction Management

January 19, 2021

TO: ARCHITECTS, ENGINEERS, AND CONTRACTORS

FROM: MICKEY ALLEN, ASSISTANT FINANCE DIRECTOR *m Allen*
ALABAMA REAL PROPERTY MANAGEMENT (RPM)

FRANK BARNES, DIRECTOR
ALABAMA DIVISION OF CONSTRUCTION MANAGEMENT (DCM) *Frank Barnes*

SUBJECT: UPDATED GUIDANCE ON FIRE ALARM CONTRACTOR PERMITS

DCM's July 17, 2012 *Memorandum On Act 2009-657 Requiring Certification Of Fire Alarm Contractors* is superseded by this January 19, 2021 bulletin which includes updated references, terms, and details for projects under DCM's jurisdiction.

Act 2009-657, effective August 1, 2012, requires fire alarm contractors to be permitted through the State of Alabama Fire Marshal's Office. In accordance with §34-33A-9, if a fire alarm contractor is going to do work in Alabama, the contractor must deliver to the local building official a copy of their State Fire Marshal's Fire Alarm Permit. DCM requires the following:

Plan Review

For work involving fire alarm systems in Optional 65% Intermediate Plan Review submittals and in Final Plan Review submittals, the requirement for a fire alarm contractor to be permitted through the State of Alabama Fire Marshal's Office shall be included on plan notes and/or in the project manual.

Bidding

Pursuant to §34-33A-11(b), for work involving fire alarm systems, General Contractors must submit a copy of the fire alarm contractor's State Fire Marshal's Fire Alarm Permit at the same time as submission of the subcontractor and supplier list to the lead design professional, which is required within 24 hours after receipt of bids. The architect or engineer shall reject fire alarm contractors who cannot provide a copy of the required permit.

Pre-Construction Conference

For work involving fire alarm systems, General Contractors must provide a copy of the fire alarm contractor's State Fire Marshal's Fire Alarm Permit to the DCM Inspector at the pre-construction conference.

If you have any questions, please contact DCM's Plan Review Division at 334-242-4082 or planreview@realproperty.alabama.gov.

cc: Scott Pilgreen, Alabama State Fire Marshal, State of Alabama Fire Marshal's Office.



STATE OF ALABAMA
DEPARTMENT OF INSURANCE

State Fire Marshal's Office

201 Monroe Street, Suite 1790

Post Office Box 303352

Montgomery, Alabama 36130-3352

Telephone: (334) 241-4166

Facsimile: (334) 241-4158

Internet: www.firemarshal.alabama.gov

JIM L. RIDLING
COMMISSIONER

EDWARD S. PAULK
STATE FIRE MARSHAL

ROBERT BENTLEY
GOVERNOR

MAILING ADDRESS:

P.O. BOX 303352

MONTGOMERY, AL 36130-3352

OVERNIGHT ADDRESS:

201 MONROE STREET, SUITE 1790

MONTGOMERY, AL 36104

PLEASE USE FEDEX, UPS OR DHL

APPLICATION FOR STATE FIRE MARSHAL'S CERTIFIED FIRE ALARM CONTRACTOR PERMIT

PLEASE PRINT OR TYPE

In compliance with Sections 34-33A-1 to 34-33A-13, Code of Alabama, 1975, I hereby apply for a State Fire Marshal's Permit to engage in the installation, repair, alteration, maintenance, or inspection of fire alarm systems in Alabama.

CERTIFICATE HOLDER'S NAME: _____

CERTIFICATE HOLDERS SSN: _____ DOB: _____

NAME OF BUSINESS: _____

BUSINESS OWNER NAME: _____

BUSINESS OWNER SSN: _____ DOB: _____ ARE YOU A U.S. CITIZEN? ___ YES ___ NO

BUSINESS ADDRESS: _____

MAILING ADDRESS: _____

BUSINESS TELEPHONE: _____ PERMIT TYPE: INITIAL [] RENEWAL []
Current Permit # _____

This is to certify that _____ (certificate holder) is presently employed by _____ (business) in the capacity of _____ (title) and is authorized to act for the business in all matters pertaining to the installation, repair, alteration, addition, maintenance, or inspection of fire alarm systems in the state of Alabama.

If for any reason the certificate holder terminates employment with the above business, we the undersigned, do understand that the State Fire Marshal's Office is to be notified within thirty (30) days, and that the business will have nine (9) months or until expiration of the current permit, whichever comes first, to submit an application on a new certificate holder and be issued a new permit.

I the undersigned do certify that the information provided above is true and correct. I the undersigned do understand that submission of false information is grounds for license revocation and may subject me to criminal penalties.

Owner/President Signature _____ Date _____ Certificate Holder Signature _____ Date _____

INITIAL/RENEWAL FEE \$100.00

INCLUDE FEE WHEN SUBMITTING APPLICATION. (CHECK OR MONEY ORDER MADE PAYABLE TO THE STATE FIRE MARSHAL'S FUND.)

INCLUDE COPY OF NICET CERTIFICATION CARD (CURRENT) FOR FIRE ALARM SYSTEM TECHNICIAN - LEVEL III.

CERTIFIED FIRE ALARM CONTRACTOR ATTACHMENT

1. Home address of the NICET Certificate holder:

Street Address

City State Zip Code

Phone Number (this is the number you can be reached at)

2. Are you a United States Citizen? YES NO
3. I understand as the NICET Certificate holder for this company that I am licensed only by this company and no other company within the Fire Alarm Industry.
4. I understand as the NICET Certificate holder for this company that I am responsible for the layout, installation, maintenance, repair or alterations performed by this company.

Signature of NICET Certificate holder

Date

CERTIFICATE OF ASBESTOS FREE BUILDING MATERIALS

The undersigned hereby states that all building materials incorporated, installed, and used during the construction process for the below listed project by the Contractor or its Subcontractors of any tier are 100% asbestos free. **Asbestos Free means containing 0% asbestos in any form.** Refer to Section 01600, Product Requirements.

McKee Project Name: _____

McKee Project Number: _____

CERTIFICATION: The undersigned certifies that he or she is authorized to execute contracts and legal documents on behalf of the General Contractor as legally named, that this certification is submitted in good faith without fraud or collusion with any other person, that the information indicated in this document is true and complete, and that the document is made in full legal agreement.

To: _____
(Owner / Awarding Authority of Construction Contract)

Date _____

Legal Name of General Contractor _____

General Contractor State License No. _____
(Exactly as appears on license including designation letters)

General Contractor Mailing Address _____

By (Legal Signature) _____

Name & Title (print) _____

Telephone Number _____

E-Mail Address _____

SECTION 01010 - SCOPE OF THE WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS AND GENERAL INFORMATION

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 specification sections apply to the work of this section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Type of the Contract.
 - 2. Work Under This Contract.
 - 3. **Completion Times.**
 - 4. Division of Construction Management User Fees.
 - 5. Project Work Identification.
 - 6. Owner-furnished products.
 - 7. Supervision.
 - 8. Contractor Use of premises.
 - 9. Definitions.
 - 10. Work Under Other Contracts.
 - 11. Building and Site Construction.
 - 12. General Issues.
 - 13. Temporary Electrical Power and Jobsite Utilities.
 - 14. Site Security and Insurance Requirements.
 - 15. Protection of Work in Place.
 - 16. Work restrictions.
 - 17. Owner's occupancy requirements.
 - 18. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 1 Section 01500 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 TYPE OF CONTRACT

- A. Construction Contract (DCM Form C-5, April 2020).

1.4 WORK UNDER THIS CONTRACT

- A. Sealed Proposal shall be received as follows:
 - 1. One (1) Sealed Envelope MUST include the following:
 - a. General Contractor's Name and State General Contractor's License number MUST be legible on the front of the envelope.
 - b. One (1) Bid Proposal for all work as indicated on drawings and specifications.
 - c. Unit Price Attachment Sheet MUST be included if document is included in the project manual.
 - d. One (1) Contractor Completion Time Form for all work as indicated on drawings and specifications if document is included in the project manual.

- e. One (1) Bid Bond or certified check.
- f. One (1) Sales Tax Form.

1.5 COMPLETION TIMES

- A. All work shall be completed no later than October 15, 2025.

1.6 DIVISION OF CONSTRUCTION MANAGEMENT USER FEES

- A. Refer to the Alabama Department of Finance, Construction Management Division Administrative Code, Chapter 355-16-1, "Collection Of User Fees" dated March 31, 2020.
 - 1. The Contractor shall include in his Base Bid Proposal all "Basic Permit Fee".
 - 2. **Do not** include the "Plan Review Fee" or the "Contract Administration Fee" in your Proposal.
 - 3. The Contractor shall be responsible for all "Re-Inspection Fees" per 355-16-1-.03 "Fees Required", (5) "Additional Fees", (b).

1.7 PROJECT / WORK IDENTIFICATION

- A. General: Project name is as indicated in the Advertisement For Bids and as shown on the Contract Documents prepared by McKee & Associates, 631 S. Hull Street Montgomery, Alabama 36104.
- B. Contract Documents: Indicate the work of the Contract and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the Contract Documents include, but are not limited to the following:
 - 1. Existing site conditions and restrictions on use of the site including ingress and egress to the site.
 - 2. Grading operations at the site.
 - 3. The Contractor shall be responsible to secure the site during the execution of the work and provide proof of insurance including but not limited to General Liability, W/C, Auto, Equipment, etc.
- C. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, the Project Manual, Technical Specification Sections, Drawings, Addenda and modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and the Drawings, and including but not necessarily limited to, printed material referenced by any of the above. It is recognized that the Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.

1.8 OWNER FURNISHED PRODUCTS

- A. Toilet Accessories: Paper Towel Dispenser, Toilet Tissue Dispenser, Soap Dispenser's.
- B. Washer/Dryer, Concession Equipment.

1.9 SUPERVISION

- A. Supervision: The Contractor shall provide adequate supervision of the project to ensure proper supervision for all work.

1.10 CONTRACTOR USE OF PREMISES

- A. General: During the entire cleanup period the Contractor shall have the exclusive use of the premises for cleanup operations, including full use of the site as shown on the Drawings.
- B. Limitations of exclusive use of the site:
 - 1. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to applicable rules and regulations affecting the work while engaged in project performance. See site plan for ingress and egress to the site, or if not indicated, same shall be as designated by the Architect.
 - 2. Keep existing public roads, driveways and entrances serving the premises clear and available

- at all times. Do not use these areas for parking or storage of materials. Remove dirt, mud, debris, etc., from site, sidewalks, streets, and public right-of-way as it occurs.
3. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds and or designated storage areas as indicated.
 4. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.
 5. The Owner, and their representatives, the Architect and their Consultants, as well as authorities having jurisdiction will require site accessibility for inspections, observations, and perhaps other purposes, related to the planned new construction. All Contractors shall assist in such accessibility, to at least the point of providing and maintaining accessible dry paths to work in progress.
 6. Furnish and install by contractor temporary barricades, fencing, etc., as indicated or otherwise required, to restrict pedestrian and vehicular traffic from construction operations, including in part, Owner's staff, the public, students, children, and residents of the adjacent residential neighborhoods.
 7. Construction operations shall not affect in any manner, the on-going operations of the Owner, immediately adjacent facilities, adjacent property owners or businesses, or others. Refer to Division 1 Section "Special Conditions" for additional information and requirements regarding coordination with Owner's activities, etc.
 8. Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.
 9. All contractors and their employees shall limit any discussion of the Work of this project to the Owner's representatives named in the front of this Project Manual, Consultants employed, inspecting authorities with jurisdiction, and the Architect. In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
 10. Parking on-site, if any, shall be limited to the "staging areas" indicated on the Drawings, or if not indicated, as mutually agreed between the Architect and Contractor at the Pre-Construction Conference.
 11. Smoking or other use of tobacco products shall not be permitted within the structure of the Building, Owner's facilities or on roofs.
 12. The use or presence of alcohol and/or other debilitating substances shall not be permitted in the construction of the building and or on the project site.
 13. Firearms and/or other weapons shall not be permitted on the project site.
 14. The Contractor shall furnish necessary temporary toilets for all work forces on the job site.

PART 2 - SCOPE OF THE WORK

2.1 DEFINITIONS

- A. The Scope of the Work of the Contract is meant to be viewed as a successor to the General Special Conditions of the Contract. Should any discrepancy or ambiguity be noted, the Scope of the Work of the Contract shall apply and the General Special Conditions of the Contract shall defer to Scope of the Work of the Contract Documents. The scope of the work shall be taken in its entirety by all contractors. In signing the contract all contractors have read and understand that the Scope of the Work and the General Special Conditions are taken in their entirety.
 1. The term "Design Consultant" shall be construed to mean "Architect".
 2. The terms "Owner" shall mean " Blount County Board of Education ".

2.2 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at the Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. Work done by others or by Owner.
 - a. Any items noted N.I.C.
 - b. Construction Testing as defined in applicable sections of the project manual.

2.3 BUILDING AND SITE CONSTRUCTION

- A. The Contractor shall maintain the entire site, provide dust control and keep the streets clean at all times and or as directed by the Architect. The Contractor shall call for and be responsible for the locating of all utilities prior to start of work. Use extreme care when working in close proximity to the existing water lines to prevent movement and damage to the water lines.
- B. The Contractor shall install and or replace all fencing including furnish and install all temporary fencing as required for all work including safety barriers, signs, traffic directional signals, temporary stripping, flagman, temporary road plates and any temporary roads around any obstruction and or work being constructed. The Contractor shall make all provisions to keep the public and or temporary access roads open during the duration of the work.
- C. The Contractor shall maintain & level, all temporary roads and temporary lay down and storage areas using same stone base material. Roads must have no potholes, dips, or rises and provide access to and from the site and other locations on site. The Contractor shall maintain the temporary roads used to move material on the site. Temporary roads are existing and the Contractor shall maintain these temporary roads throughout the duration of construction activity while Contractor is onsite.

2.4 GENERAL ISSUES

- A. The Contractor shall be responsible for their own on-site safety requirements within the site per OSHA regulations.
- B. Only an approved company owned and insured vehicle shall be allowed on to the construction site. Vehicles shall be clearly marked and identified with the company logo and or name.

2.5 TEMPORARY ELECTRICAL POWER AND JOBSITE UTILITIES

- A. The Contractor is responsible for the all costs associated with temporary electrical requirements for performance of the work. The Contractor shall be responsible for the all costs associated with temporary water required for the performance of the work. The Contractor is responsible for all other utility costs as required for the performance of the work.

2.6 SITE SECURITY / INSURANCE REQUIREMENTS

- A. The Contractor shall have care custody and control of the site. Contractor shall be responsible for the replacement of their material, equipment and any loss of such. Contractor shall be responsible for securing all material and equipment. If there is a loss and or damage of material and equipment, that loss shall go against the Contractor's insurance coverage.

2.7 PROTECTION OF WORK IN PLACE

- A. The Contractor shall protect all completed work and any rework shall be the responsibility of the contractor **at** no additional cost to the owner.

2.8 WORK RESTRICTIONS

- A. Existing Utility Interruptions: 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 Architect and Owner not less than two days in advance of the proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's and Owner's written permission.
- B. Nonsmoking Building: Smoking and smokeless tobacco will not be permitted within the new construction after floor slabs are poured.

2.9 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy: Owner will occupy adjacent parking lots during entire construction period. Cooperate with Owner during construction operations adjacent to or near the existing building and parking to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
- B. Maintain access to existing walkways and other adjacent occupied or used facilities. Do not close or obstruct walkways or other occupied or used facilities without written permission from Owner and authorities having jurisdiction. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- C. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to place and install equipment in completed areas of building, before Substantial Completion, provided such does not interfere with completion of the Work. Such placement of equipment shall not constitute acceptance of the total Work.

2.10 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications another Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 3 - NOT APPLICABLE

END OF SECTION

SECTION 01011 - CONTINGENCY ALLOWANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND GENERAL INFORMATION

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 specification sections apply to the work of this section.

PART 2 - CONTINGENCY ALLOWANCES

2.1 BASE BID PROPOSAL

- A. The General Contractor shall include the following sums:
 1. **One Hundred Fifty Thousand Dollars (\$150,000.00)** as a contingency to cover unforeseen conditions or minor changes that are necessary to correct or supplement the work as detailed in the Contract Documents.
 2. **Thirty Thousand Dollars (\$30,000.00)** as a contingency for Alabama Power Company Aid to Construction as detailed in the Contract Documents.
 3. **Twenty-Five Thousand Dollars (\$25,000.00)** as a contingency for Security Equipment as detailed in the Contract Documents.
 4. **Seventy Thousand Dollars (\$70,000.00)** as a contingency for an Emergency Two-Way Radio System as detailed in the Contract Documents.
 5. **One-Hundred Thousand Dollars (\$100,000.00)** as a contingency for the Sound System as detailed in the Contract Documents.

- 2.2 The Contractor shall include in his bid proposal(s) all costs of office, job supervision, overhead, profit, and bond on these Contingency Allowances, because no such costs will be paid to Contractor for work performed under these Contingency Allowances. Only the direct costs of performing work under this provision shall be paid under and charged against the Contingency Allowance; such cost includes costs of materials and delivery, installation labor, payroll taxes and insurance, equipment expense, and the cost of subcontracted work (subcontractor's cost may include a maximum of 15% mark-up for overhead and profit).

PART 3 – AUTHORIZATION OF CONTINGENCY ALLOWANCES

- 3.1 After unknown conditions are identified and examined and the scope of work and method of repair determined, or request for a proposal to cover additional work has been issued by the Owner, the Contractor shall submit a proposal for such work to the Architect for the Owner's approval. If the Owner approves of such proposal, he will issue written authorization to the Contractor to perform the work and charge the related costs to the Contingency Allowance. At the Owner's option, work performed under this provision may be ordered done on a time and material basis, in which case; the Contractor shall keep accurate records of all time and materials used and submit such records to the Architect for his approval at the end of each day's work.
- 3.2 An accounting of the costs charged against this Contingency Allowance shall be mutually maintained by the Contractor, Architect, and Owner throughout the course of the project. Any of this Contingency Allowance not spent shall be credited to the Owner by Change Order at close out of the project. Refer to Contingency Allowance Form attached to this Section.
- 3.3 Provide for payment.
 - A. The Contractor shall include a line item in the *Schedule of Values* entitled "Contingency Allowance". The estimated value of work completed pursuant to fully executed Contingency Allowance Authorizations may be included in the Contractor's monthly Applications for Payment. Payments under this Contingency Allowance shall not exceed the net, total of fully executed Contingency Allowance Authorizations.

CONTINGENCY ALLOWANCE
01011-1

3.4 CONTINGENCY ALLOWANCE AUTHORIZATION FORM

Form to be filled in its entirety.

To: McKee & Associates, Architects From: _____
Project: _____ Company _____
_____ Address _____
_____ Contact and Email _____
Project Number _____ Date: _____
Building Commission Number: _____ Authorization Number: _____

In accordance with Specification Section 01011 – CONTINGENCY ALLOWANCE, the Contractor [_____] is hereby authorized to proceed with the changes in Work as are described below and is to be paid for the performance of these changes as provided in Specification Section 01011. This Authorization shall become effective when it is signed by the Contractor and the Owner's representative and it is understood and agreed that the amount(s) stipulated below constitute full compensation for these changes in Work.

TOTAL AMOUNT OF THIS AUTHORIZATION \$

ORIGINAL AMOUNT OF THE CONTINGENCY ALLOWANCE	\$
NET TOTAL OF PREVIOUS AUTHORIZATIONS	\$
PREVIOUS REMAINING CONTINGENCY ALLOWANCE	\$
TOTAL AMOUNT OF THIS AUTHORIZATION	\$
CONTINGENCY ALLOWANCE REMAINING AFTER THIS CONTINGENCY	\$

Recommended By: _____ Authorized By: _____ Accepted By: _____
Architect _____ Owner _____ Contractor _____

END OF SECTION

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Section 01600 "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, that may or may not involve an adjustment to the Contract Sum or the Contract Time, as an Architect's Supplemental Instructions, "ASI".

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time in the form of an ASI. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. ASIs issued by Architect, if adjustments to contract sum or contract time are involved, are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in ASI after receipt of ASI, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Include data as needed to validate material costs
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.

CONTRACT MODIFICATION PROCEDURES

01250-1

5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Change Order, Architect will issue a Change Order for signatures as required.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive, "CCD": Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Construction Change Directive contains a complete description of change in the Work.

PART 2 – NOT APPLICABLE

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. **At the discretion of the Architect, the contractor shall provide separate Schedule of Values for work on projects involving multiple locations, campuses, sites, buildings etc. and/or multiple scopes of work. Additional line items may be required within each separate Schedule of Values (i.e. separate line items for multiple buildings located on same site).**
- B. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- C. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Submit draft of DCM Form C-11.
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.

- f. Change Orders (numbers) that affect value.
- g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
- 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
- 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 6. Provide a separate listing on Application and Certificate for Payment (Standard ABC Form C-10) for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or evidence of bonded warehousing.
- 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 8. Unit Costs: Provide a separate line item in the Schedule of Values for each unit cost. Line-item to show value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
- 10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Progress payments shall be submitted to Architect by the 25th of the month. The period covered by each Application for Payment is one month, ending on the 23rd of the month.
- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of Change Orders issued before last day of construction period covered by application only after all agency approvals.
- D. Transmittal: Submit 6 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
- F. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- G. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. Certificate of Substantial Completion (DCM Form C-13)
 5. Form of Advertisement for Completion (DCM Form C-14)
 6. Evidence that claims have been settled.
 7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 8. Final, liquidated damages settlement statement.

PART 2 – NOT APPLICABLE

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Submittals Schedule.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Special reports.
- B. Related Sections include the following:
 - 1. Division 1 Section 01290 "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 1 Section 01310 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 1 Section 01330 "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 1 Section 01322 "Photographic Documentation" for submitting construction photographs.
 - 5. Division 1 Section 01400 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 SUBMITTALS

- A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit two copies at weekly intervals.
- D. Material Location Reports: Submit two copies at monthly intervals.
- E. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
- F. Special Reports: Submit two copies at time of unusual event.
- G. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Verify availability of qualified personnel needed to develop and update schedule.
2. Discuss any constraints.
3. Review time required for review of submittals and re-submittals.
4. Review requirements for tests and inspections by independent testing and inspecting agencies.
5. Review time required for completion and startup procedures.
6. Review and finalize list of construction activities to be included in schedule.
7. Review submittal requirements and procedures.
8. Review procedures for updating schedule.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 2. Initial Submittal: Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section 01330 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 14 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions, if any, and show how the sequence of the Work is affected.
- E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
1. Refer to Division 1 Section 01290 "Payment Procedures" for cost reporting and payment procedures.
 2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be broken down within principal contracts in amounts typically not greater than \$30,000, but in no case greater than 5 percent of the Contract Sum.
 3. Each activity cost shall reflect an accurate value subject to approval by Architect.
 4. Total cost assigned to activities shall equal the total Contract Sum.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the time effect, if any, of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost-and resource-loaded, time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and commissioning.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, timescaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. Approximate count of personnel at Project site by trade.
 3. Equipment at Project site.
 4. Material deliveries.
 5. High and low temperatures and general weather conditions.
 6. Accidents.
 7. Meetings and significant decisions.
 8. Unusual events (refer to special reports).
 9. Stoppages, delays, shortages, and losses.
 10. Meter readings and similar recordings.
 11. Emergency procedures.
 12. Orders and requests of authorities having jurisdiction.
 13. Change Orders received and implemented.
 14. Construction Change Directives and Architect Supplemental Interpretations (Instructions) received and implemented.
 15. Services connected and disconnected.
 16. Equipment or system tests and startups.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request For Interpretation (RFI). Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor must employ skilled personnel with experience in scheduling and reporting techniques or must employ a scheduling consultant. Submit qualifications and examples of previous scheduling for evaluation (and approval) by the Architect.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three (3) work days before each regularly scheduled progress meeting or Contractor may update schedule at the monthly progress meeting.
 - 1. The revised schedule should be updated immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting, no later than three days after the progress meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01322 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction digital video.
 - 2. Periodic construction photographs.

1.3 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each digital photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.
- B. Digital Construction Photographs: Submit one print of each digital photographic view within seven days of taking photographs.
 - 1. Format: Digital.
 - 2. Identification: The following information is required on each CD submitted:
 - a. Name of Project.
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Date photograph was taken if not date stamped by camera.
 - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - f. Unique sequential identifier.
 - 3. Digital Images: Submit a complete set of digital image electronic files as a Project Record document on USB Drives. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.
- C. Digital Video: Submit one copy of each digital video with protective sleeve or case within seven days of recording.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project
 - b. Name of Architect.
 - c. Name of Contractor.
 - d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - e. Date digital video was recorded.
 - f. Weather conditions at time of recording.
 - 2. Transcript: To include an audio narrative with the following information as a minimum.
 - a. Name of Project.
 - b. Date digital video was recorded.
 - c. Weather conditions at time of recording.

- d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - EXECUTION

2.1 CONSTRUCTION PHOTOGRAPHS

- A. Film Images:
 1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Architect.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 1. Date and Time: Include date and time in filename for each image.
 2. Field Office Images: Maintain one set of images on USB Drives in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- C. Preconstruction Photographs: Before starting construction, take color, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 1. Flag construction limits before taking construction photographs.
 2. Take eight photographs to show existing conditions adjacent to property before starting the Work.
 3. Take eight photographs of existing buildings either on or adjoining property in order to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 12 color, digital photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

2.2 CONSTRUCTION DIGITAL VIDEO

- A. Narration: Describe scenes on digital video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 1. Confirm date and time at beginning and end of recording.
 2. Begin each digital video with name of Project, Contractor's name, and Project location.
- B. Preconstruction Digital Video: Before starting construction, provide digital video of the Project site and surrounding properties from different vantage points, as needed to properly record all preexisting site conditions and adjacent conditions of all roadways, drives, structures that will incur construction traffic.
 1. Flag construction limits before recording construction video.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of construction.
 4. Show protection efforts by Contractor.

PART 3 – NOT APPLICABLE
END OF SECTION

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 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.

1.2 SUMMARY

- A. The General Contractor shall use website software “**Submittal Exchange**” to conduct all submittal reviews in electronic format. **Paper format submittals will NOT be accepted.** All recordkeeping, date stamping, access controls, shall be **paid for by the Contractor** with access given to the entire Project Team. The software shall be capable of the following:
- B. Costs:
1. The General Contractor shall include the full cost of Submittal Exchange project subscription in their proposal. **The Contractor shall cover the full cost of Submittal Exchange project subscription for the project. The Contractor contractually, shall be fully responsible for all costs required to maintain full functionality through the acceptance of ALL project closeout requirements and documents. NO OTHER SOFTWARE WILL BE CONSIDERED.**
 2. **Contact Submittal Exchange at subex-sales_ww@oracle.com or call 1-800-633-0738 to verify costs prior to bid.**
 3. At the Contractor’s option, training is available from **Submittal Exchange** regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024 ext. 2
 4. Internet Service and Equipment Requirements:
 - a. Email address and Internet access at the Contractor’s main office.
 - b. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.
 5. The General Contractor is responsible for maintaining and keeping Submittal Exchange active throughout the entire project, including closeout documents.
- C. Procedures:
1. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using **Submittal Exchange**, a website service designed specifically for transmitting submittals between construction team members.
 2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 3. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
 4. Submittal Preparation – the Contractor may use any or all of the following options:
 - a. Subcontractors and Suppliers provide electronic (PDF) submittals to the Contractor via the **Submittal Exchange** website.
 - b. Subcontractors and Suppliers provide paper submittals to the General Contractor who electronically scans and converts to PDF format.
 - c. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
 5. The Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

6. The Contractor shall transmit each submittal to Architect using the Submittal Exchange website, www.submittalexchange.com.
 7. The Architect / Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.
 8. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
 9. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 01770 – Closeout Procedures.
- D. Related Sections include the following:
1. Division 1 Section 01290 "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 2. Division 1 Section 01320 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 3. Division 1 Section 01322 "Photographic Documentation" for submitting construction photographs and construction videotapes.
 4. Division 1 Section 01770 "Closeout Procedures" for submitting warranties.
 5. Division 1 Section 01781 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 6. Division 1 Section 01782 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 7. Division 1 Section 01820 "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 8. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will, under certain circumstances described hereinafter, be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 1 Section 01320 "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

SUBMITTAL PROCEDURES
01330-2

1. Initial Review: Allow **14** business days for initial review of each digital submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Re-submittal Review: Allow **10** business days for review of each re-submittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow **10** business days for initial review of each submittal.
 - a. Structural, mechanical, plumbing, electrical, civil, audio/visual, sound system, and kitchen equipment components are examples of the Work that require sequential review. Architect will advise if there are others.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings. Provide another area of this same size for the Architect to affix his stamp. Stamp includes the following four categories: Reviewed, Furnish as Noted, Rejected, Revise and Resubmit; the Architect will mark one or more of these categories and return submittal to Contractor.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - i. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.D.2.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 06100.D.2.R1 (R2, R3 etc. if necessary).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- F. Deviations: Encircle or otherwise specifically identify deviations and list the deviations from the Contract Documents on submittals and list the deviations on the transmittal form accompanying submittal.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use AIA Document G810 or equivalent with at least the following information.
 - a. Project name.
 - b. Date.

- c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked "Reviewed" or "Furnished as Noted".
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "Reviewed" or "Furnished as Noted".

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: McKee & Associates CAD Files shall not be released.
 - 1. Should the Contractor require CAD Files they are encouraged to seek PDF to CAD Conversion vendors and/or software.

PART 2 - PRODUCTS

2.1 DIGITAL ACTION SUBMITTALS

- A. General: Prepare and submit Digital Action Submittals required by individual Specification Sections.
- B. All submittals shall be sent to the Architect no later than 45 calendar days from "Notice To Proceed".
 - 1. Submittals shall be sent to Greg Anderson at the following email address:
submittals@mckeeassoc.com.
- C. Submittals regarding mechanical, plumbing, electrical and structural items shall be sent directly to the Engineer of record.
 - 1. A digital copy of the transmittal shall be sent to the Architect at the following email address:
submittals@mckeeassoc.com.
- D. Product Data: Collect information into a single digital submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each the digital submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit digital copy of the Product Data, unless otherwise indicated. Mark up and retain returned digital copy as a Project Record Document.
- E. Digital Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.

- o. Wiring Diagrams: Differentiate between manufacturer-installed and field installed wiring.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Digital Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
- 3. Number of Copies:
 - a. Submit each original digital drawing submittal (specifically prepared for the project). Do not include MSDS documentation in any submittal. Architect will retain marked-up copy for his records and will return 1 (one) digital marked-up copy to the Contractor.
 - b. Submit digital copy (bound in sets) of hardware submittals, fixture schedules, manufacturers' data and all other submittals that have been prepared in an 11 inch by 17 inch or smaller format. The Architect will return 1 (one) digital copy set to the Contractor.
 - i. Upon receipt of his digital marked up shop drawings/submittals, the Contractor shall make as many copies for distribution as he deems necessary, however he shall retain one copy to mark-up further to show any and all construction changes that modify the submittal in any form. This document(s) shall be turned over to the Owner at the end of the Project along with the Record Documents.
- F. Color code: On all digital shop drawings submittals, schedules, etc., the Contractor's marks shall be in red, the Architect's in green and the Engineer's (if any involved) in blue. All comments shall be initialed by a responsible party within each organization.
- G. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available. **Colors will not be approved until all color submittals are received by the architect.**
 - a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.
 - b. All color submittals are due within 45 days of the Notice to Proceed.
 - c. The architect will be allowed 15 days from the date of the receipt of the last color submittal to approve colors.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of

materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample set and one will be returned. Mark up returned Sample set as a Project Record Sample.
 - i. Construct a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - ii. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- H. Interior Color Selections: Any submittals that are associated with the aesthetics of the interior design shall not be approved until all submittals associated with the interior design are in the Architect's possession.
- I. Submittals Schedule: Comply with requirements specified in Division 1 Section 01320 "Construction Progress Documentation."
- J. Application for Payment: Comply with requirements specified in Division 1 Section 01290 "Payment Procedures."
- K. Schedule of Values: Comply with requirements specified in Division 1 Section 01290 "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit digital copy of each submittal, unless otherwise indicated.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section 01400 "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section, 01310 "Project Management and Coordination."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- L. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section 01782 "Operation and Maintenance Data."
- P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.

- R. **Manufacturer's Field Reports:** Prepare written information documenting factory authorized service representative's tests and inspections. Include the following, as applicable:
 1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- S. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. **Construction Photographs and Videotapes:** Comply with requirements specified in Division 1 Section 01322 " Photographic Documentation."
- U. **Material Safety Data Sheets (MSDSs):** Submit information directly to Owner; do not submit to Architect.
 1. Architect will not review submittals that include MSDSs and will return the entire submittal for re-submittal.

2.3 DELEGATED DESIGN

- A. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. **Delegated-Design Submittal:** In addition to Shop Drawings, Product Data, and other required submittals, submit one copy of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each digital submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. **Approval Stamp:** Stamp each digital submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. **General:** Architect will not review digital submittals that do not bear Contractor's approval stamp and will return them without action.

- B. Action Submittals: Architect will review each digital submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each digital submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. REVIEWED—Indicates that reviewed submittal is satisfactory.
 2. REJECTED—Indicates submittal is not satisfactory and another properly prepared submittal of same or another product must be prepared and resubmitted.
 3. FURNISH AS NOTED—Indicates submittal is satisfactory if the changes, modifications, notes, etc. marked by the Architect are made a part of the submittal.
 4. REVISE AND RESUBMIT—Indicates although parts of the submittal are satisfactory, there are enough significant modifications that must be made to require the Contractor, subcontractor, supplier, and/or manufacturer to provide additional essential information to his submittal and then resubmit it to the Architect.
- C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01410 – SCHEDULE OF SPECIAL INSPECTIONS

SCHEDULE OF SPECIAL INSPECTIONS				
Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
1.00	Fabricators			
1.01	Review the quality control procedures of the following fabricators for completeness and adequacy relative to the fabricator's scope of work: steel fabricator, lightgage truss fabricator, wood truss fabricator.	Periodic	AISC Certified Fabricators are exempt from the Fabricator's Quality Control Procedural Evaluation by the Special Inspector.	
2.00	Soils and Footings			
2.01	Verify bearing capacities of soils beneath footings.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	
2.03	Verify site preparation prior to beginning fill placement. Verify fill material type, placement method, lift thickness, and compaction of fill material. Verify in-place density of compacted fill.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	
3.00	Concrete Construction			
3.01	Spread footings are excepted from the inspections listed below.			
3.02	Continuous footings are excepted from the inspections listed below.			
3.03	Slabs on grade are excepted from the inspections listed below.			
3.04	Concrete foundation walls are excepted from the inspections listed below.			
3.05	Concrete cast on non-composite form deck is excepted from the inspections listed below.			
3.06	Inspect concrete formwork except as noted above for proper dimensions. Verify that construction joints are properly keyed. Verify that slab recesses, if any, have been installed.	Periodic	Prior to each pour.	

3.07	Inspect reinforcing steel except as noted above for installation including size, spacing and bar clearances. Verify that lap splices and embedment lengths are per the construction documents. Verify that dowels for work above are properly aligned and spaced to match other work.	Periodic	Prior to each pour. Verify that dowels are properly aligned and spaced to match wall reinforcement. Verify that dowel projection is adequate for proper lap splice.	
3.09	Inspect weldability of reinforcing steel other than ASTM A706.	Periodic	Prior to fabrication.	
3.12	Inspect welded reinforcement.	Periodic	Prior to pour.	
3.13	Inspect column anchor bolts	Periodic	Prior to each pour, inspect column anchor bolts to verify proper embedment, spacing, and type of anchor.	
3.14	Inspect bolts and/or headed studs to be installed in concrete prior to and during placement of concrete.	Continuous	During placement and concreting operations.	
3.15	Verify each proposed concrete mix for the project.	Periodic	For each proposed mix.	
3.16	Sample all concrete for strength tests and test concrete for slump, air content, temperature, and other tests.	Continuous	During placement operations. Reference concrete specifications for specific tests and frequencies.	
3.17	Inspect concrete placement except as noted above.	Continuous		
3.18	Inspect all concrete curing operations as noted in the extents column.	Periodic	Monitor during hot, cold and windy conditions. Reference concrete specifications.	
3.21	Erection of precast concrete members.	Periodic	Inspect all connections.	
3.23	Verification of in-situ concrete strength prior to removal of forms and shores supporting weight of concrete.	Periodic	Prior to form or shoring removal.	
3.24	Verification of in-situ concrete strength prior to backfilling walls.	Periodic	Prior to backfilling operations.	
4.00	Masonry Construction			
4.02	Verification of fm' (specified compressive strength of masonry).	Periodic	Prior to construction. Additional verification for every 5,000 square feet during construction of Tornado Shelter.	

4.03	Inspect proportions of site prepared mortar and grout. Inspect placement of masonry units and construction of mortar joints. Inspect reinforcement for correct size and spacing. Inspect work for correct location and type of embeds and anchor bolts. Inspect work for size and location of structural elements.	Periodic	At beginning of masonry construction, prior to each new grout pour, and every 250 square feet of masonry thereafter.	
4.04	Inspect masonry cells and cleanouts prior to placement of grout. Inspect grout proportions. Inspect placement of reinforcement.	Periodic (U.N.O.)	Prior to grouting of masonry (and continuous inspection of grout space at Tornado Shelter)	
4.05	Inspect grouting operations to ensure compliance with code and construction documents. Inspect placement of all grout.	Continuous	During grouting.	
4.08	Inspect type size and location of anchors, including details of anchorage of masonry to structural members, frames or other construction.	Continuous	During installation of anchors at Tornado Shelter.	
4.10	Inspect welding of reinforcing bars.	Continuous	During installation and welding of all reinforcing.	
4.11	Inspect protection of masonry during cold weather and hot weather.	Periodic	During periods with temperatures below 40 degrees or above 90 degrees.	
4.12	Inspect preparation of grout specimens, mortar specimens and / or prisms.	Continuous	During preparation of all specimens.	
4.13	Verify compliance with all required inspection provisions of the construction documents and approved submittals.	Periodic	As required for duration of project.	
5.00	Steel Construction			
	Inspection of the steel pieces			
	Inspection of frame			
5.01	Inspect high-strength bolts, nuts and washers: a. Identify markings to conform to ASTM standards specified in the construction documents. b. Inspect manufacturer's certificate of compliance.	Periodic	Reference project specifications and ASTM material specifications; AISC 335, (Sect A3.4); AISC LRFD (Sect A3.3).	
5.02	Inspect high-strength bolting: Snug-tight Bearing-type connections (non-pretensioned)	Periodic		
5.03	Inspect high-strength bolting: Pretensioned connections (along with applicable pre-installation calibration procedures).	Periodic or Continuous	Continuous monitoring required for pretensioning using calibrated wrench method or turn-of-nut method without matchmarking.	

5.04	Inspect and verify structural steel material: a. Identification markings to conform to ASTM standards specified in the approved construction documents. b. Manufacturers' certified mill test reports.	Periodic	Confirm that materials meet applicable ASTM specifications noted in construction documents.	
5.05	Inspect and verify weld filler materials: a. Identification markings to conform to AWS specification in the approved construction documents. b. Manufacturer's certificate of compliance required.	Periodic	Confirm that materials meet applicable ASTM specifications noted in construction documents.	
5.06	Inspect welding: Structural Steel: 1) Complete and partial penetration groove 2) Multipass fillet welds. 3) Single-pass fillet welds > 5/16"	Continuous	Per specifications and AWS D1.1	
5.07	Inspect welding: Structural Steel: 1) Single-pass fillet welds ≤ 5/16" 2) Floor and deck welds. 3) Welded studs used for diaphragm. 4) Sheet steel for cold-formed framing. 5) Stairs and railings.	Periodic	Per specifications and AWS D1.1	
5.08	Roof and Floor deck: Inspect attachment of deck to supporting members.	Periodic	Prior to concrete or roofing being installed.	
5.09	Inspect steel frame joint details for compliance with approved construction documents (including addenda): a. Details such as bracing and stiffening. b. Member locations. c. Application of joint details at each connection.	Periodic	Inspect complete frame.	
6.00	Wood			
6.01	Inspect fabricated wood trusses and shop built components.	Periodic	Inspect truss production in shop unless fabricator is approved by building official and submits certification of compliance at end of scope of work.	
6.02	Inspect site-built assemblies. Inspect erected trusses including bridging and attachments.	Periodic	Inspect erected trusses and installation of bridging.	
6.03	Inspect plywood roof diaphragms.	Periodic	Inspect all diaphragms after rough carpentry is complete, including required nail attachment.	
6.04	Inspect installation and anchorage of wood trusses.	Periodic	Verify all bracing required by truss manufacturer as well as permanent 'X'-bracing as shown on contract drawings. Verify anchorage per contract drawings and manufacturer's recommendations.	

7.00	Architectural / MEP Components			
7.04	Verify application of sprayed fire-resistant materials.			
7.08	Inspect EIFS applications.			
7.10	Test smoke control systems.			
9.00	Special Inspections for Seismic Resistance Seismic Force-Resisting System(s) and/or Designated Seismic Systems:		See General Notes on Sheet S0.1 of structural drawings.	
9.02	Inspect nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system including drag-struts, braces and hold-downs.	Periodic		
9.06	Inspect anchorage of access floors and storage racks 8 feet or greater in height.	Periodic		
9.07	Inspect erection and fastening of exterior cladding and interior and exterior veneer.	Periodic		
9.08	Inspect erection and fastening of all non-load bearing walls.	Periodic		
9.09	Inspect mechanical and electrical components per 1707.7 as determined by MEP designer(s).	Periodic		
9.18	Review certified mill test reports of all concrete reinforcing.			

INSPECTION AGENTS	
#	Firm, Address, Telephone

Note: The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Inspection Agent(s) may be subject to the approval of the Building Official.

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 1 Section 01100 "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 1 Section 01330 "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Division 1 Section 01700 "Execution Requirements" for progress cleaning requirements.
 - 4. Divisions 2 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
 - 5. Division 2 Section 02282 "Termite Control" for pest control.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Sewer connections will not be in place for most if not all of the duration of the project. When and if the off-site sewer is installed by others and sewer piping under this contract is installed, should the contractor decide to connect to the sewer he must pay all sewer use charges until the project is turned over to the Owner.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use

TEMPORARY FACILITIES AND CONTROLS

as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
 - 1. **Minimum Requirement: One (1) 10 foot wide x 44 foot long unit required.**
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack board.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services. Sanitary Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

2. Connect temporary sanitary sewer from construction office to a submerged temporary holding tank, as directed by authorities having jurisdiction.
 3. Provide erosion control structures to drain storm water from site.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction from existing water lines in the street. Contractor shall pay for any metering costs and associated fees required by the City Water Department.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
1. Toilets: Use of Owner's existing toilet facilities will not be permitted.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide temporary electric meter power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Contractor shall be responsible for any charges associated with said service.
1. Install electric power service overhead, unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.
1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- I. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities, or other suitable high speed internet connection.
1. Provide DSL in primary field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area with good visibility of construction. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- D. Project Identification and Temporary Signs: Erect Project identification, General Contractor's sign, Architect's sign and other signs as approved. Install signs where directed to inform public and individuals seeking entrance to Project. Subcontractor signs are not permitted.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
- F. Temporary Stairs: Until permanent stairs are available, provide one temporary stair between floors, located near the center of the building.
- G. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 1 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 2 02100 Section "Site Preparation."
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Carefully remove and turn over Architect's sign to the Architect.
 2. Where area is intended for landscape development, in an area that has been used as a compacted temporary road bed, remove soil and aggregate fill that do not comply with requirements for landscaping fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section 01770 "Closeout Procedures."

END OF SECTION

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and equal products.
- B. Related Sections include the following:
 - 1. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Equal Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating equal products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.

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- h. Identification of items that require early submittal approval for scheduled delivery date.
3. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Substitution Request Form: Use CSI Form 13.1A.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified materials or products cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

- c. If Contractor's Substitution Requests are repeatedly (i.e. 3 times) submitted incomplete, i.e., no definitive response to items "a" through "l", the Architect will not consider any further Substitution Requests.
- C. Equal Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of an equal product request. Architect will notify Contractor of approval or rejection of proposed equal product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Use product specified if Architect cannot make a decision on use of an equal product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section 01330 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- B. The Contractor MUST provide the Owner with a Certificate of Asbestos Free Building Materials at the end of the project certifying that all building materials incorporated, installed, and used during the construction process of the project by the Contractor or its Subcontractors of any tier are 100% asbestos free. Asbestos Free means containing 0% asbestos in any form. The Certificate of Asbestos Free Building Materials form is included in the project manual.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store cementitious products and materials on elevated platforms.
 - 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.
9. 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:
 - a. 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.
 - b. 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.
 - c. 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.
 - d. 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.
 - e. 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.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Warranty start for mechanical and electrical equipment being date of substantial completion.
- D. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

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4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Equal Products" Article to obtain approval for use of an unnamed product.
- E. Product Selection Procedures:
1. Products and Manufacturers: In particular instances there may only be a single product or manufacturer appropriate for use on the project, in which case where Specifications name a single product and manufacturer and say "no equal", provide the named product.
 2. Products and Manufacturers: When one or two products or manufacturers are specified and have the words "or approved equal", the Contractor may propose to provide alternatives in the form of a Substitution Request which once reviewed by the Architect will be either accepted or rejected. If Substitution Request is submitted for approval 7 days prior to the receipt of bids and approved by the Architect, said approvals will be included in Addenda. Only those Substitution Requests listed as approved in Addenda may bid the project.
 3. Products and Manufacturers: Where Specifications include a list of three (3) or more names of both products and manufacturers, provide one of the products listed that complies with requirements. No substitutions will be accepted.
 4. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or an equal product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
 5. Visual Matching Specification: Where Specifications require matching an established Sample, product must comply with all requirements and must match Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product
 6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

1.8 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution under the conditions set forth in this section under Product Selection Procedures, if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution under the conditions set forth in this section under Product Selection Procedures and when the following conditions are satisfied. If the following conditions are not satisfied,

- C. Architect will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution requires no or only very minor revisions (as determined by the Architect), to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.
 8. Requested substitution has been coordinated with other portions of the Work.
 9. Requested substitution provides specified warranty.
 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - NOT APPLICABLE

PART 3 - NOT APPLICABLE

END OF SECTION

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Section 01310 "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section 01330 "Submittal Procedures" for submitting surveys.
 - 3. Division 1 Section 01770 "Closeout Procedures" for submitting Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by professional engineer.

1.4 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction

indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

2.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on RFI, "Request for Interpretation."

2.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required

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dimensions.

3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

2.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Submit a final property survey certifying exact locations of site improvements including building(s), parking lots, roadways and utilities including structure elevations, top and invert, distances from property lines, and with any variation from the original civil staking and layout and utility drawings identified.

2.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling unless shown otherwise on drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
 - C. Install products at the time and under conditions that will ensure the best possible results.
 - D. Maintain conditions required for product performance until Substantial Completion.
 - E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
 - F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
 - G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
 - H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
 - I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

2.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Pre-installation Conferences: Include Owner's construction forces at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

2.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste.

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Mark containers appropriately and dispose of legally, according to regulations.

- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

2.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section 01400 "Quality Requirements."

2.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

2.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

PART 3 – NOT APPLICABLE

END OF SECTION

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- B. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 1 Section 01290 "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Mark the Architect's punch-list so-as-to identify those items that are still outstanding and uncorrected at the time of submission.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for Project.
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - f. Remove labels that are not permanent.
 - g. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - i. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - h. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - i. Replace parts subject to unusual operating conditions.
 - j. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - k. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - l. Leave Project clean and ready for occupancy.

END OF SECTION

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- B. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Digital Record Drawings.
 - 2. Digital Record Specifications.
 - 3. Digital Record Product Data.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of digitally scanned marked-up Record Prints.
- B. Record Specifications: Submit one copy of digitally scanned Project Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one digitally scanned copy of each Product Data submittal.
- D. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one clean set of blue- or black-line white prints of the Contract Drawings and Shop Drawings and one copy of the project manual (specification) at the job site for the sole purpose of recording changes to the drawings and specifications.
- B. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - 1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - 2. Accurately record information in an understandable drawing technique.
 - 3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
- C. Content: Types of items requiring marking include, but are not limited to, the following:
 - 1. Dimensional changes to Drawings.
 - 2. Revisions to details shown on Drawings.
 - 3. Locations and depths of underground utilities.
 - 4. Revisions to routing of piping and conduits.
 - 5. Revisions to electrical circuitry.
 - 6. Actual equipment locations.
 - 7. Duct size and routing.
 - 8. Locations of concealed internal utilities.

9. Changes made by Change Order or Construction Change Directive. (Posted on Documents.)
 10. Changes made following Architect's written orders, i.e. ASIs. (Posted on Documents.)
 11. Details not on the original Contract Drawings. (Posted on Documents.)
 12. Field records for variable and concealed conditions.
 13. Record information on the Work that is shown only schematically.
 14. Changes made in response to Contractor's questions, i.e. RFIs. (Posted on Documents.)
- D. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - E. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - F. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - G. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable. Where posting is required, post on Drawing Set and in Specifications on sheets or pages adjacent to or on top of where modification applies.
 - H. Attachment method shall be taped at top only, so as to access original underneath.
 - I. Digitally scan all documents and provide on CD Rom to Architect.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications. Maintain one clean copy of the project manual (specification) at the job site for the sole purpose of recording changes to the drawings and specifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Digitally scan all documents and provide on CD Rom to Architect.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
- B. Maintain one clean set at the job site for the sole purpose of recording changes to the drawings and specifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications and Record Drawings where applicable.
- C. Digitally scan all documents and provide on CD Rom to Architect.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours. Architect's representative will review Record Documents with the project superintendent each month to determine to his satisfaction whether or not Record Documents are being kept up to date. Failure to do so will result in the delay of processing pay request until Record Documents are brought up to date.

END OF SECTION

SECTION 01782 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit three copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE

Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

OPERATION AND MAINTENANCE DATA

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual,

insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number.

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2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.

- 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service: Some equipment and products require maintenance by the manufacturer, supplier or subcontractor, i.e., an authorized service representative, as part of the warranty. The General Contractor shall ensure that said maintenance work is done and provide copies of service reports to the Owner.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of Record Drawings in Division 1 Section 01781 "Project Record Documents."
- G. Comply with Division 1 Section 01770 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01820 - DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1 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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 1. Demonstration of operation of systems, subsystems, and equipment.
 2. Training in operation and maintenance of systems, subsystems, and equipment.
 3. Demonstration and training digital media.

1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 1. At completion of training, submit one complete training manual for Owner's use.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section 01400 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Instructor: Engage a qualified instructor to prepare instruction program and training modules, and

to coordinate between Contractor and Owner for number of participants, instruction times, and location.

- B. Instructor shall demonstrate to Owner's personnel how to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 02071 - DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of demolition work is shown on drawings, as well as all items necessary to complete new work indicated on plans.
- B. Schedule of Demolition Work: Demolition includes but is not limited to the following:
 - 1. Demolition of the existing buildings, utilities, footings, and underground structures as indicated on the Drawings.
 - 2. All other items indicated required to be demolished to complete new work.
 - 3. An inspection shall be performed by the Owner after the removal of all footings. The Contractor shall coordinate with the Owner for these inspections prior to filling in the voided footing areas.
 - 4. Any damage to existing facilities at the site after the Contractor takes possession shall be repaired by this Contractor at his expense.
 - 5. Contractor shall replace grass/sod damaged during the construction. Fill in ruts caused by equipment with topsoil and grass over to match existing conditions.
 - 6. As indicated on the Drawings.

1.3 SUBMITTALS

- A. Schedule: Submit proposed methods and operations of demolition work to Architect for review prior to start of work. Include in schedule coordination for shut-off, capping and continuation of utility services as required.
 - 1. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

1.4 JOB CONDITIONS

- A. Condition of Structures: Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable.
- B. Explosives: Use of explosives will not be permitted.
- C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
- D. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- E. Protections: Ensure safe passage of persons (night or day) around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities and persons.
 - 1. Erect temporary covered passageways as required by authorities having jurisdiction.
 - 2. Provide interior and exterior shoring, bracing, or support and necessary protection, to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.
 - 3. Provide temporary fencing as necessary to secure the limits of construction. Fencing shall be substantial to deter passage, fencing material shall be at Contractors discretion.
- F. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no

cost to Owner.

- G. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
 - 2. All electrical work to be removed, relocated or reconnected shall be performed by a licensed Electrical Contractor in accordance with the NEC and any applicable local codes and ordinances.

PART 2 – PRODUCTS [NOT APPLICABLE]

PART 3 - EXECUTION

3.1 DEMOLITION - DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove from site debris, rubbish and other materials resulting from demolition operations.
- B. Burning of removed materials from demolished structures will not be permitted on site.
- C. Removal: Transport materials removed from demolished structures and legally dispose of off-site, in area approved by all local authorities and ADEM.

END OF SECTION

SECTION 02100 - SITE PREPARATION, GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Prior to starting construction operations, the Contractor shall remove all vegetative growth, debris, and other objectionable matter standing or lying on the surface within the limits of the areas to be excavated or filled and shall demolish and remove there from such buildings and other structures as are specifically designated on the drawings for removal.
- B. Any damage to natural terrain or to vegetation or objects designated to remain shall be repaired, replaced, or otherwise compensated for, as determined by the Owner's Representative, at the Contractor's expense.
- C. Contractor shall remove all trees including the stump, root system, etc. from the construction area except those trees that are designated in the field by the Owner to remain intact.

END OF SECTION 02100

SECTION 02110 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The Engineer will designate the areas to be cleared and grubbed and will indicate all trees, shrubs, plants, and other items to remain. Any damage to natural terrain or to vegetation or objects designated to remain shall be repaired, replaced, or otherwise compensated for as determined by the Engineer at the expense of the Contractor.
- B. Where required, the Contractor shall post with the Owner any performance bond or liability insurance which may be required to guarantee the satisfactory replacement or repair of materials, structures or landscaping within the work area.
- C. Ornamental trees, cultivated shrubs and similar growths which occupy streets, alleys, or other public rights-of-way or easements but which lie outside the limits of excavation shall remain undisturbed and shall be carefully preserved and protected by the Contractor throughout all stages of the construction work.
- D. All cut or scarred surfaces of trees or shrubs shall be treated with an asphaltum base paint especially prepared for tree surgery.
- E. The Contractor shall not enter upon private property for any purpose without first obtaining permission from its Owner and he shall be responsible for the preservation of, and shall use every precaution necessary to prevent damage to all trees, shrubbery, fences, culverts, bridges, pavement, driveways, sidewalks, etc., and to all water, sewer, gas, telephone, and electric lines thereof, and to all other public or private property along or adjacent to the work.

1.2 CLEARING

- A. The area within the construction limits shall be cleared of all surface objects, and all trees, stumps, roots and other objectionable obstructions resting on or protruding to the surface of the original ground except those designated to be retained.

1.3 GRUBBING

- A. All areas within the construction limits shall be grubbed of all objectionable matter on or projecting to the ground surface.
- B. All fill areas shall be grubbed to a depth of at least one foot below the natural ground.

1.4 CLEARING AND GRUBBING LIMITS

- A. Clear and grub within grading limits shown by sections, grade elevations, and/or new contours shown on the drawings.
- B. Clear and grub within the limits of building and paving lines and to a point five (5) feet beyond building lines.
- C. Clearing and grubbing limits for utilities, where not specifically indicated on the drawings, will be determined by the area necessary to complete the work.
- D. In no case shall the clearing and grubbing limits extend beyond property and/or easement lines

established by the Owner, unless the Contractor obtains permission from the adjoining owner or owners.

1.5 DISPOSAL OF MATERIALS

- A. The Contractor shall submit a plan for the satisfactory disposal of materials and debris from the clearing and grubbing operations for approval by the Architect.
- B. The Contractor must comply with all local, state, and federal laws and ordinances pertaining to the type material being disposed of and secure and submit written permission from any applicable agencies regarding the method of disposal.

END OF SECTION 02110

SECTION 02150 - PREPARATION OF SUBGRADE

PART 1 - GENERAL

1.1 Work Included

- A. All dikes and structural fill areas that will receive fill material shall be cleared of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter will be completely removed.
- B. Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials, refer to Section 312200 for undercutting. The surface shall be scarified to a depth of 6 inches before the fill is started.
- C. Sub-grade shall be free from any standing water and within the allowable moisture limits, as determined by the Geotechnical Engineer, prior to placement of any fill material.
- D. All temporary stones for roadways, construction accesses, sidewalks, drives, etc. shall be completely removed at the end of the project. It is the General Contractor's sole responsibility to fully remove these temporary materials as the project is completed. This applies to all materials, equipment, etc. the Contractor transports to the project site, no exceptions. There shall be no wasting of stone on-site. Claims such as the wasted material or temporary stone was a particular subcontractor's to address and it was not noted in their work/trade section to address is irrelevant and final responsibility shall be the General Contractor's as noted above.
- E. All prepared subgrades shall be 80% stone free. Subgrade that contains more than 20% in any 12" x 12" area shall be removed and replaced by General Contractor with acceptable subgrade material to be approved by the Landscape Architect.
- F. The Contractor shall install all underground utilities and sleeves prior to base installation. If base is installed, compacted, tested, etc., and utilities are later installed, then the base shall be considered contaminated and shall be removed/reinstalled, recompact, and retested at the Contractor's expense, no exceptions. Final base is NOT considered temporary stone; therefore, contamination shall not be allowed. Contaminated base shall be removed and replaced at the Contractor's expense.
- G. When proofrolling is required by the Geotechnical Engineer, it shall be proofrolled per the Geotechnical Report.

END OF SECTION 02150

SECTION 02155 – SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section of specifications covers the requirements of the contractor to protect the project site and adjoining properties from soil erosion and runoff. Section reviews methods of construction, erosion control measures, maintenance of erosion control features, and construction runoff permitting.

PART 2 - MATERIALS

2.1 TEMPORARY BERMS

- A. A temporary berm is constructed of compacted soil or riprap, with or without a shallow ditch, at the top of fill slopes or transverse to the centerline of fills. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

2.2 TEMPORARY SLOPE DRAINS

- A. A temporary slope drain is a facility consisting of temporary earthen swale, stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe, sod or other material acceptable to the Engineer that may be used to carry water down slopes to reduce erosion. These items shall be required at no additional compensation to manage the stormwater runoff during construction.

2.3 SEDIMENT STRUCTURES

- A. Sediment basins, ponds, and traps are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

2.4 CHECK DAMS

- A. Check dams are barriers composed of logs and poles, large stones, or other materials placed across a natural or constructed drainway.

2.5 TEMPORARY SEEDING AND MULCHING

- A. Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes, including waste sites and borrow pits, shall be seeded when and where necessary to control erosion.

2.6 BRUSH BARRIERS

- A. Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operation.
- B. Brush barriers are placed on natural ground at the bottom of fill slopes, where the most likely erodible areas are located, to restrain sedimentation particles.

2.7 STRAW CHECKS

- A. Straw erosion checks are temporary measures to control erosion and prevent siltation.
- B. Straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water runoff is a problem.

2.8 TEMPORARY SILT FENCES

- A. Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the run-off water.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be responsible for obtaining a NPDES permit in accordance with requirements of this section and notes on the plans notes sheet and in compliance with regulations established by the EPA and the ADEM. The Contractor shall be responsible for providing the Qualified Credentialed Professional (QCP) and/or Qualified Credentialed Inspector (QCI) to perform inspections as required by the permits. The costs of inspections and associated documentation shall be the responsibility of the Contractor. The QCP/QCI shall inspect all BMP's daily and keep daily inspection reports in a log book that shall be submitted for review by the Owner's Representative prior to approval of the monthly pay request.
- B. The Contractor shall exercise planning and forethought in coordinating the work of protecting the project and adjoining properties from soil erosion by effective and continuous erosion control methods of either a temporary or a permanent nature.
- C. The Contractor shall plan his clearing work and his entire construction operations in such a manner as to effectively control soil erosion and prevent pollution of streams, ponds, and/or drains as would result from silt or soil runoff or as would result from any materials used in the construction operations such as oil, grease, paints, chemicals, or any construction debris.
- D. The Contractor shall intercept and block drainage from the construction site by means of silt fences, silt barriers, sedimentation pools or other measures as required.
- E. The erosion control work shall cover all disturbed areas within the project and/or easement along which the project has been installed. Erosion control work shall not be limited to the easement but shall include all disturbed areas as necessary.

3.2 METHODS OF CONSTRUCTION

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches, and settling basins.
- B. Construction operations shall be restricted to the areas of work indicated on the Plans and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and fill operations and to direct the Contractor to

provide immediate permanent or temporary pollution control measures to prevent contamination of the adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

- C. Excavated soil material shall not be placed adjacent to watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If, for any reason, construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer at no cost to the Owner.
- D. The Contractor shall not pump silt-laden water from trenches or other excavations into adjacent watercourses. Instead, silt-laden water from excavations shall be discharged into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- E. Prohibited construction procedures include, but are not limited to, the following:
 - 1. Dumping of spoil material into any streams, wetlands, surfacewaters, or unspecified locations.
 - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface water areas.
 - 3. Pumping of silt-laden water from trenches or excavations into surface waters or wetlands.
 - 4. Damaging vegetation adjacent to or outside of the construction area limits.
 - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
 - 6. Permanent or unauthorized alteration of the flow line of any stream.

3.3 EROSION CHECKS

- A. The Contractor shall furnish and install straw erosion checks in all locations indicated on the Plans, surrounding the base of all deposits of stored excavated materials outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Plans, shall be installed immediately after the site is cleared and before excavation has begun at the locations indicated. Checks located around stored material shall be located approximately 6-feet from that material. Each check shall be butted tightly against the adjoining check to preclude short-circuiting of the erosion check.

3.4 MAINTENANCE OF EROSION CONTROL FEATURES

- A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.
- B. Silt fences shall have sediment deposits removed if it reaches a depth of fifteen inches (15") or $\frac{1}{2}$ the height of the fence. Sediment removed from the silt fence shall be removed from the site.

- C. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.

3.5 CONSTRUCTION RUNOFF PERMITTING

- A. It shall be the responsibility of the contractor to obtain a State NPDES General Permit ALG610000 for construction site runoff as part of this project. Application for coverage is made by submittal of a Notice of Intent (NOI) and a permit fee to:

ADEM – Water Division
Post Office Box 301463
Montgomery, AL 36130-1463
Telephone (334) 271-7700

- B. The construction general permit requires the Contractor to use Best Management Practices (BMPs) to control storm water runoff. The general permit requires inspections on monthly basis to ensure compliance with State water quality standards. Onsite precipitation must also be recorded.

END OF SECTION 02155

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 Related Documents:

- A. Drawings and general provisions of the Contract including General, Supplemental, and Special Conditions.
- B. Geotechnical Report dated September 19, 2022; Terracon Project Number E5215061.
- C. Geotechnical Report is included at the end of this section and is an integral part of this specification.**

1.2 Summary:

- A. This specification section covers stripping, excavation, borrow, fill placement, undercutting, and other items incidental to earthwork operations required to complete the work.
- B. For purposes of earthwork construction, all soils shall be classified using the Unified Soil Classification System.
- C. The Contractor shall be fully responsible for the disposal of all excess materials resulting from excavation or other earthwork operations.
- D. The Contractor shall be fully responsible for furnishing, delivering, and placing all fill material necessary to achieve the finish grades indicated in the contract documents.
- E. The Contractor shall be fully responsible for location, construction, maintenance, and removal of all haul roads. The Contractor shall be responsible for obtaining all rights-of-way necessary for the completion of the work and not indicated in the Contract Documents.
- F. Specifications for excavation and embankment shall follow the most recent edition of the ALDOT Standard Specifications for Highway Construction.
- G. The Contractor shall be responsible for the prevention of erosion, runoff control, and for the protection of existing streams. Hay bales, silt fencing, and sheeting exposed areas shall be utilized to minimize sediment transport from cut areas, temporary spoil piles, and other exposed areas.
- H. The Contractor is responsible for obtaining stormwater and runoff permits, if required.
- I. Where excavations are made adjacent to existing buildings, other structures or utilities or in paved streets or alleys, the Contractor shall take particular care to sheet, shore and brace the sides of the excavation adequately so as to prevent any undermining of or settlement beneath such structures, utilities or pavements. Where necessary, the Contractor shall be responsible for underpinning or bracing existing structures, utilities or pavement to prevent settlement or other damage. Where necessary, the Contractor shall be responsible for temporarily relocating existing utilities. All such relocations shall be coordinated with the Owner of the utility.
- J. Sheeting, shoring, and bracing materials shall not be left in place unless shown in the contract documents or approved in writing by the Engineer. Such materials shall be removed in such manner as to protect the work, workmen, the Owner's facilities, adjacent

property and the general public.

- K. The Contractor shall take all due precautions for the safety of the work, the workmen, the

Owner's facilities and the general public.

- L. The Contractor shall comply with federal, state, and local ordinances, laws, guidelines and regulations related to earthwork and excavation.
- M. In all cases, where materials are deposited around open excavations, they shall be placed so that, in the event of rain, no damage will result to the work or adjacent property.

1.3 Unit Prices:

- A. All excavation to be unclassified.
- B. However, all stabilization and undercut & replacement will be handled with a quantity allowance with unit price being provided on the bid proposal form to be included in the base bid. The bid proposal form will have unit prices for the undercutting of unsuitable soils and replacing with compacted structural fill. The quantity allowance breakdown is as follows:

Base Bid

Unsuitable soils and replacing with compacted structural fill: 800 CY

The unit price for "undercutting" shall include all cost associated with removing unsuitable soil from below the established subgrade elevation, off-site disposal and replacing with off-site material conforming to the project specifications and compacted to project requirement. Unsuitable material refers to material that is not suitable for building or pavement support for reasons associated with material properties, such as highly plastic soils, "fat" clays, and old fill. Material, which is otherwise suitable, but above the optimum moisture and requires moisture conditioning prior to use as engineered fill shall not be considered as "unsuitable". Note the unit prices are being provided for the addition to and deletion from the contract base bid as required by changing field conditions during construction.

- C. The measurement process for unsuitable soil amounts shall be the initial responsibility of the contractor. The basis for measurement will be based on a before and after cross section survey of the area in question performed by a licensed surveyor. No truck counts will be allowed. Measurements will be verified by the Owner's on-site Geotechnical Engineer.

1.4 Submittals:

- A. The Contractor shall submit laboratory test data for each type of compacted fill material indicating the following:
 - 1. Supplier or borrow location.
 - 2. Maximum Standard Proctor Density-ASTM D698.
 - 3. Optimum Moisture Content.
 - 4. Liquid Limit.
 - 5. Plasticity Index.

1.5 Quality Assurance:

- A. The Owner will secure geotechnical services to perform in-place density testing as directed by the Engineer.
- B. The Contractor shall employ whatever means necessary to provide excavations and fill embankments that properly drain and are reasonably smooth and uniform. Final subgrade elevations shall be within reasonably close proximity to the design elevations specified in the contract documents. In areas to receive pavements or buildings, the final subgrade elevations shall be within 1" of the specified elevation. In other areas, the final subgrade elevations shall be within 1.25" of the specified elevation.

1.6 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 a trench.
- 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.
- E. Cut line: Elevations, lines, and final cut subgrades in cut over excavated areas.
- F. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- G. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations or "cut line" as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or "cut line" or beyond indicated dimensions without direction by Geotechnical engineer and Architect. Unauthorized excavation, as well as remedial work directed by Geotechnical Engineer and Architect, shall be without additional compensation.
- H. Fill: Soil materials used to raise existing grades.
- 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. Unsuitable material:
 - 1. Fills: Topsoil; Frozen materials; construction materials; clods of clay and stones larger than 4" (unless otherwise specified); organic material, including silts; and inorganic material including silts which are too wet to be stable, or other materials identified by the Geotechnical Engineer.
 - 2. Existing subgrade: Same materials as listed in paragraph 1 above that are not capable of direct support of slabs, pavement and similar items with the possible exception of improvement by compaction, proof rolling, or similar methods as directed and approved by the Geotechnical Engineer.
 - 3. Unsuitable materials identified by the geotechnical report and drawings shall be anticipated and included in the base bid. See 1.3B Unit Prices for additional information.
- M. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

PART 2 - PRODUCTS

2.1 Soil Materials:

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Topsoil:
 - 1. Materials considered useful for topsoil by the Architect/Geotechnical shall be stockpiled at his direction at locations shown on the Drawings or as directed in the field. Topsoil shall be kept free from sub-soil, clay lumps, brush, objectionable weeds, litter, stones larger than 1/2 inches in diameter, stumps, roots, and other materials that would interfere with planting and maintenance operations.
 - 2. All topsoil shall be stored on the site by Contractor in a location approved by the Architect. The Contractor shall use such topsoil for the purpose of fulfilling the topsoil requirements specified in this Contract. Protect stockpile by immediately compacting, dressing down and seeding with annual rye for temporary cover. Provide a silt fence around the base of topsoil pile, after completing storage, to control erosion.
 - 3. Use topsoil stockpiles on site as necessary to complete landscape work indicated on Drawings and in accordance with specifications for landscaping.
- C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GC, SC, SW, SP, SM, ML, and CL, 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. Soils that exhibit a liquid limit less than 50 and a plasticity index of less than 30.
- D. Unsatisfactory Soils: ASTM D 2487 soil classification groups 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.
- E. Backfill and Fill: Satisfactory soil materials.
 - F. Subbase: At least 90 percent passing a 1-1/2 inch sieve.
 - G. Base: ASTM D2940; with at least 95 percent passing a 1-1/2 inch sieve and not more than 8 percent passing a No. 200 sieve.
 - H. 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.
 - I. 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.
 - J. 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.
 - K. 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.
 - L. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
- B. 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.

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.
 - 1. Erosion control is the responsibility of the Contractor. Items shown on the Drawings are considered the minimum acceptable; however, as site conditions change, additional measures may be required to control sediment.
 - 2. The Contractor shall indemnify and hold harmless the Owner, Architect, Engineer, Owner's representatives, and their agents and employees from any claim from their work.

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.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. No explosives will be allowed.

3.4 EXCAVATION, GENERAL

- A. All excavation on this project is unclassified regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
- B. Material encountered in grading operation that, in the opinion of the Geotechnical Engineer or Owner, is unsuitable or undesirable shall be as follows:
 - 1. The removal of unsuitable material will be directed by the Geotechnical Engineer or his field representative. All unsuitable material that is removed by the Contractor shall become the property of the Contractor and be disposed of off site or in a manner satisfactory to the Owner at no additional cost. All undercut shall be included in the Base Bid. See section 1.3 B. unit prices for quantity allowances.

2. Back fill for these areas will be with material approved by the Geotechnical Engineer, with layers of acceptable material compacted to the requirements set forth in these specifications.
- C. Undercutting and replacement of unsuitable soils may be required to the underlying stiff soils. All undercut and replacement shall be handled in accordance with 1.3B Unit Prices above.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.1 feet. Extend excavations a minimum of 10' in distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- B. Where unsuitable soils are encountered, the soils shall be completely removed to underlying stiff material per 1.3B Unit Prices above.

3.6 EXCAVATION FOR WALKS AND PAVEMENT

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades, to a distance of 8' beyond the edge of these walks and pavements.
- B. Where unsuitable soils are encountered, the soils shall be completely removed to underlying stiff material per 1.3B Unit Prices above.

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 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.
 1. Clearance: 12 inches on each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. For pipe sizes 30" and below, the "cut line" shall be 4" below the bottom of the pipe and material replaced with 4" No. 57 stone bedding unless otherwise noted.
 2. For pipe sizes larger than 30", the "cut line" shall be 6" below the bottom of the pipe and material replaced with 6" no. 57 stone bedding unless otherwise noted.

3.8 APPROVAL OF SUBGRADE

- A. Notify Architect when excavations have reached required subgrade.

- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll 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 Architect.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow 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, damp-proofing, 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 lean 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. Off-site borrow materials may be used as fill within the building and pavement areas provided that their plasticity index (PI) less than 30. Material shall have a minimum dry density of 100 pcf.
- D. High plasticity (fat clays) soils should not be used as engineered fill.
- E. 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

New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

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- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. Fill to extend 5' outside of the proposed building footprint.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698 (standard proctor).
 - 1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 8 inches of existing subgrade and each layer of backfill or fill material at 98 percent.
 - 2. Under walkways, scarify and re-compact top 8 inches below subgrade and compact each layer of backfill or fill material at 98 percent.
 - 3. Under lawn or unpaved areas, scarify and re-compact top 8 inches below subgrade and compact each layer of backfill or fill material at 98 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 0.17 ft.
 - 2. Walks: Plus or minus 0.10 ft.
 - 3. Pavements: Plus or minus 0.10 ft.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 0.08 ft. when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

- A. Drainage Piping: Drainage pipe is specified in Division 2 Section "Foundation Drainage Systems."
- B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 98 percent of maximum dry unit weight according to ASTM D 698.

- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 98 percent of maximum dry density according to ASTM D 698.
 - 2. Place and compact impervious fill material over drainage backfill to final subgrade.

3.18 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 - 3. When compacted thickness of drainage 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.

3.19 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 Architect.
- 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 1000 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.

3.20 PROTECTION

New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

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- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; 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.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02200



Geotechnical Engineering Report

**Appalachian School Additions
Oneonta, Blount County, Alabama**

Revised September 19, 2022

Terracon Project No. E5215061

Prepared for:

Blount County Board of Education
Oneonta, Alabama

Prepared by:

Terracon Consultants, Inc.
Huntsville, Alabama



September 19, 2022

Blount County Board of Education
204 Second Avenue East
Oneonta, AL 35121



Attn: Mr. Rodney Green, Superintendent
E: rgreen@blountboe.net
P: (205) 775-1950

Re: Geotechnical Engineering Report
Appalachian School Additions
Oneonta, Blount County, Alabama
Terracon Project No. E5215061

Dear Superintendent Green:

We have completed the geotechnical engineering services for the above-referenced project. This study was performed in general accordance with Terracon Proposal No. PE5215061 and the supplemental task order for rock coring that was executed on July 27, 2022.

This report provides the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the planned building.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Clifton Braxton
Field Engineer

Frank Whitman, P.E.
Senior Engineer
Alabama P.E. No. 23152



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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the **GeoReport** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

FIGURES

EXPLORATION AND TESTING PROCEDURES

SITE LOCATION AND EXPLORATION PLANS

EXPLORATION RESULTS

PHOTOGRAPHY LOG

SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report
Appalachian School Additions
Oneonta, Blount County, Alabama
Terracon Project No. E5215061
September 19, 2022

INTRODUCTION

This geotechnical exploration has been performed for the planned additions to the Appalachian School campus in Blount County, Alabama. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC

The geotechnical engineering Scope of Services for this project included the advancement of seven (7) test borings (B-1 to B-7) to auger refusal depths ranging from about 2 to 17½ feet below existing site grades, as well as three (3) rock coring locations (C-2 to C-4, planned location C-1 was inaccessible in the field).

Maps showing the site and exploration locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the exploration logs in the **Exploration Results** section.

SITE CONDITIONS

Item	Description
Property Information	350 County Highway 12 in Blount County, Alabama. Approximate GPS: 33.8883, -86.3967, see Site Location
Existing Improvements	The site is on the extensively-developed Appalachian School campus (K-12), and is partly covered by asphalt pavements, concrete pavements, sidewalks, and open grassed areas.
Topography	Previously graded, and sloped down toward the former baseball field, which was likely previously cut down to present grades
Mapped Geology	USGS-mapped as the Pottsville Formation (lower part). This geologic unit consists of light gray, thick-bedded to massive, pebbly quartzose sandstone, containing varying amounts of interbedded dark gray shale, siltstone, and thin discontinuous coal.

PROJECT DESCRIPTION

Item	Description
Information Provided	Plans from Lathan Architects dated June 6, 2022
Project Description	Two-story building addition, with gymnasium on the upper level as well as adjacent, smaller one-story additions.
Building Construction	<ul style="list-style-type: none"> ■ Concrete slab-on-grade ■ Load-bearing masonry ■ Shallow, soil-supported spread footings
Finished Floor Elevation (FFE)	The majority of the addition will be two-story with a FFE of about 1153 feet. Portions of the addition will be single-story with a FFE of about 1169 feet.
Maximum Loads	<ul style="list-style-type: none"> ■ Columns: 250 kips assumed ■ Walls: 8 kips per linear foot (klf) assumed ■ Slabs: 150 pounds per square foot (psf) assumed
Below-Grade Structures	Basement Walls
Free-Standing Retaining Walls	Assumed None
Slopes	No new slopes taller than 10 feet or steeper than 3:1 (H:V)

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section.

Model Layer	Layer Name	General Description
1	Fill	Sand (SM, SC) Fill encountered at borings B-5 and B-6
2	Clayey Sand (SC) and Lean Clay (CL)	N values of 6 to 49 blows per foot (bpf) Typically red, tan, and/or gray in color
3	Very Dense Sands (SC, SM)	N values of 50 bpf or greater Typically red, tan, and/or gray in color Some interbedded layers of Fat Clay (CH) and/or Elastic Silt (MH, locally called "whitehorse" clay)
4	Weathered Sandstone	Typically tan, gray, light red, or pink in color. Highly weathered to slightly weathered, with poor to very poor RQD.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. No groundwater was observed in any of the borings or rock coring locations.

Due to the relatively short amount of time the boreholes remained open after drilling completion, groundwater levels may have not had sufficient time to stabilize. A relatively long period of time may be necessary for a groundwater level to develop and stabilize in the clayey soils present at the site.

Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed.

At the time of construction, “perched” subsurface water could be encountered above low-permeability layers such as the relatively shallow bedrock surface, or trapped beneath/behind existing structures and pavements.

GEOTECHNICAL OVERVIEW

Terracon's borings encountered mostly native clays and sands that are generally adequate for earthwork and the support of the planned building foundations and slabs.

Some fill soils were encountered at the higher elevations of the site, at borings B-5 and B-6, and some undercut of these soils should be anticipated. These are generally areas of single-story construction and are near FFE.

Shallow sandstone and shale bedrock is present and will be encountered within many of the planned excavations. The shallowest bedrock is present at B-2, B-3, B-4, B-7, C-3, and C-4, within and near the baseball field area. These are generally areas of two-story construction.

The sandstones encountered during rock coring were slightly weathered, with poor to very poor RQD. See the Exploration Results section for the boring logs for C-2, C-3, and C-4, as well as the Photography Log. Excavation of these weathered, poor-RQD sandstones can typically be accomplished by ripping and/or with a hydraulic breaker (ram-hoe), though excavation will be slow and difficult.

If sandstone is encountered within the building pad area during mass grading, it should be overexcavated to a minimum of 1 foot below finish subgrade and backfilled within compacted soil.

The site was previously developed, and earthwork and excavations will encounter some unexpected fills, or buried construction/demolition materials.

Some borings encountered fine alternating layers of sandstone, sandy clay, and a light-gray elastic silt that is locally referred to as "whitehorse" clay. Whitehorse clays are often hard in place, but become soft and unsuitable when wetted or disturbed. However, soils containing red material in color and having thin, repeating bands of red/yellow/gray are typically suitable materials that can be used for direct support of pavements, and may be utilized as compacted fill provided that these materials are mixed when excavated. Any thicker light-gray or yellow-and-gray whitehorse strata, if encountered, would likely require undercut and replacement.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

The first phase of construction should consist of the demolition of existing structures, removing and/or rerouting of existing utilities, and the stripping and removal of all existing pavements and any other deleterious materials from the site.

Demolition of existing structures will create a disturbed subgrade where undercutting may be necessary to remove soft, loose, and/or wet soils. Foundations, burn pits, unexpected utilities, organic debris, construction debris or other deleterious materials could exist across the site, between or away from our borings. Debris fill may not become evident until construction.

After the required demolition, stripping, and performing the necessary cuts to expose the finish subgrade, but prior to placing any new fill, the subgrade should be proof-rolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proof-rolling should be performed under the observation of the Geotechnical Engineer.

The native soils are generally anticipated to pass the proof-roll (if not wet or disturbed), but removal and replacement of existing fill soils and some "whitehorse" clays should be anticipated. The actual extent of any undercut and stabilization should be determined based on the Geotechnical Engineer's evaluation (i.e., proof-rolling and/or test pits) at the time of construction.

If sandstone is encountered within the building pad area during mass grading, it should be overexcavated to a minimum of 1 foot below finish subgrade.

Following the Engineer's evaluation and any necessary undercut or stabilization efforts, new engineered fill may be placed to establish the planned finish grade.

Geotechnical Engineering Report

Appalachian School Additions ■ Oneonta, Blount County, Alabama
September 19, 2022 ■ Terracon Project No. E5215061



Fill Material Types

Earthen materials used for structural fill should meet the following material property requirements:

Soil Type ¹	USCS Classification	Acceptable Parameters (for Structural Fill)
On-Site	Sandy Lean Clays (CL) and Sands (SC, SM)	All soils to be used as fill should be free of topsoil, organics, or other deleterious materials and are properly moisture conditioned at the time of placement. All soils to be used as fill should be approved by the geotechnical engineer.
Imported Cohesive	CL, CL-ML SM, SC	Liquid Limit less than 50 Plasticity Index less than 30
Imported Granular	GW, GP SW, SP	Less than 10% Fines Content

1. Structural fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

Fill Compaction Requirements

Structural fill should meet the following compaction requirements.

Item	Structural Fill
Maximum Lift Thickness	9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
Minimum Compaction Requirements ^{1, 2}	98% of maximum standard Proctor density at all locations and elevations
Water Content Range ¹	Low plasticity cohesive: -2% to +3% of optimum Granular: -3% to +4% of optimum

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254).

Utility Trench Backfill

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to

transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow sandstone and shale bedrock is present and will be encountered within many of the planned excavations. The shallowest bedrock is present at B-2, B-3, B-4, B-7, C-3, and C-4, at and near the baseball field area.

The sandstones encountered during rock coring were slightly weathered, with poor to very poor RQD. See the Exploration Results section for the boring logs for C-2, C-3, and C-4, as well as the Photography Log. Excavation of these weathered, poor-RQD sandstones can typically be accomplished by ripping and/or with a hydraulic breaker (ram-hoe), though excavation will be slow and difficult.

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Terracon Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and any topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

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Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of one for every 2,500 square feet in the building area. One density and water content test should be performed every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing pressure ^{1, 2}	3,000 pounds per square foot (psf) for native soil or new, well-compacted engineered fill: 6,000 psf for bearing directly on weathered sandstone
Ultimate Passive Resistance ⁴ (equivalent fluid pressures)	330 pcf (native clays and sands) 420 pcf (granular backfill)
Ultimate Coefficient of Sliding Friction ⁵	0.32 (native clays and sands) 0.45 (weathered sandstone)
Grout Bond Strength	20 pounds per square inch (psi) (grouting into weathered sandstone)
Minimum Embedment below Finished Grade ⁶	18 inches

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in **Project Description**.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
6. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.

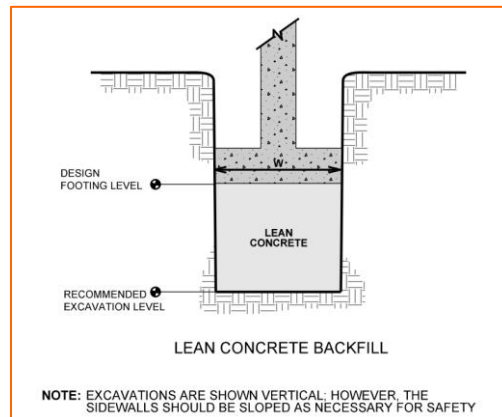
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

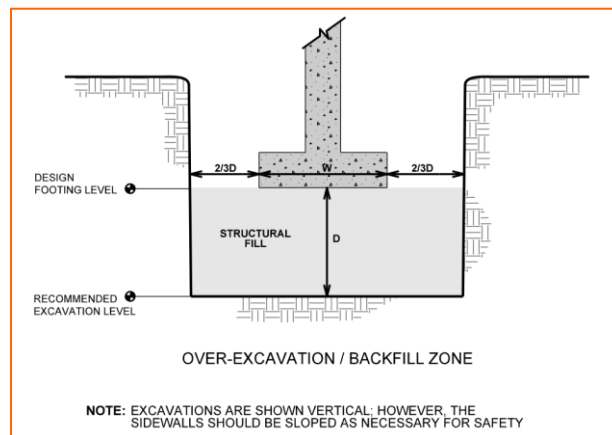
Geotechnical Engineering Report

Appalachian School Additions ■ Oneonta, Blount County, Alabama
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If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with Lean Clay (CL) or Clayey Sand (SC) placed, as recommended in the **Earthwork** section.



SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC).

Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is C**. Subsurface explorations at this site were extended to a maximum depth of 17 feet. The site properties below these depths were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

FLOOR SLABS

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor Slab Support ¹	Minimum 4 inches of free-draining crushed aggregate compacted to at least 95% of ASTM D 698 ³ New engineered fill or firm and stable, native, low- to moderate-plasticity soils below the free-draining aggregate
Estimated Modulus of Subgrade Reaction ²	125 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs must be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
3. Free-draining granular material should have less than 5% fines (material passing the No. 200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder,

the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

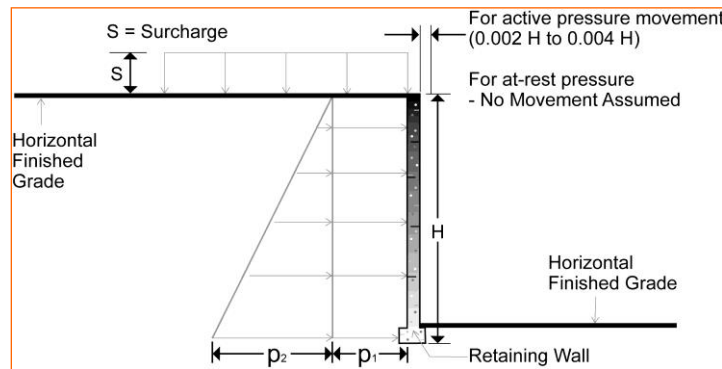
LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).

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Lateral Earth Pressure Design Parameters				
Earth Pressure Condition ¹	Coefficient for Backfill Type ²	Surcharge Pressure ^{3, 4, 5} p_1 (psf)	Effective Fluid Pressures (psf) ^{2, 4, 5}	
			Unsaturated ⁶	Submerged ⁶
Active (K_a)	Granular - 0.24	(0.31)S	(25)H	(70)H
	Fine Grained - 0.38	(0.41)S	(45)H	(85)H
At-Rest (K_o)	Granular - 0.38	(0.47)S	(40)H	(80)H
	Fine Grained - 0.54	(0.58)S	(65)H	(95)H
Passive (K_p)	Granular - 4.19	---	(440)H	(240)H
	Fine Grained - 2.75	---	(330)H	(220)H

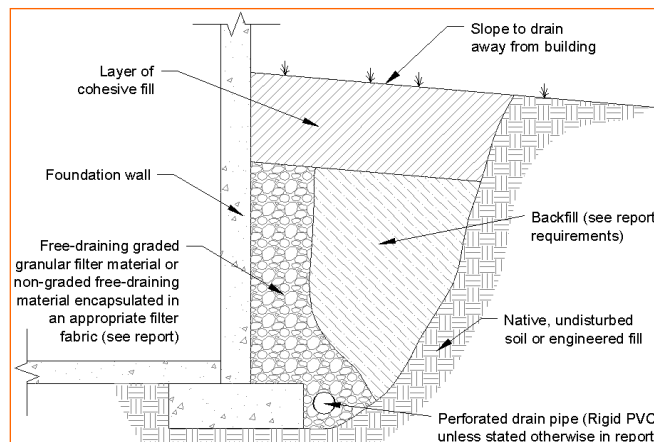
1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf for fine-grained soil, or 105 pcf for granular material.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line

around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

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Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

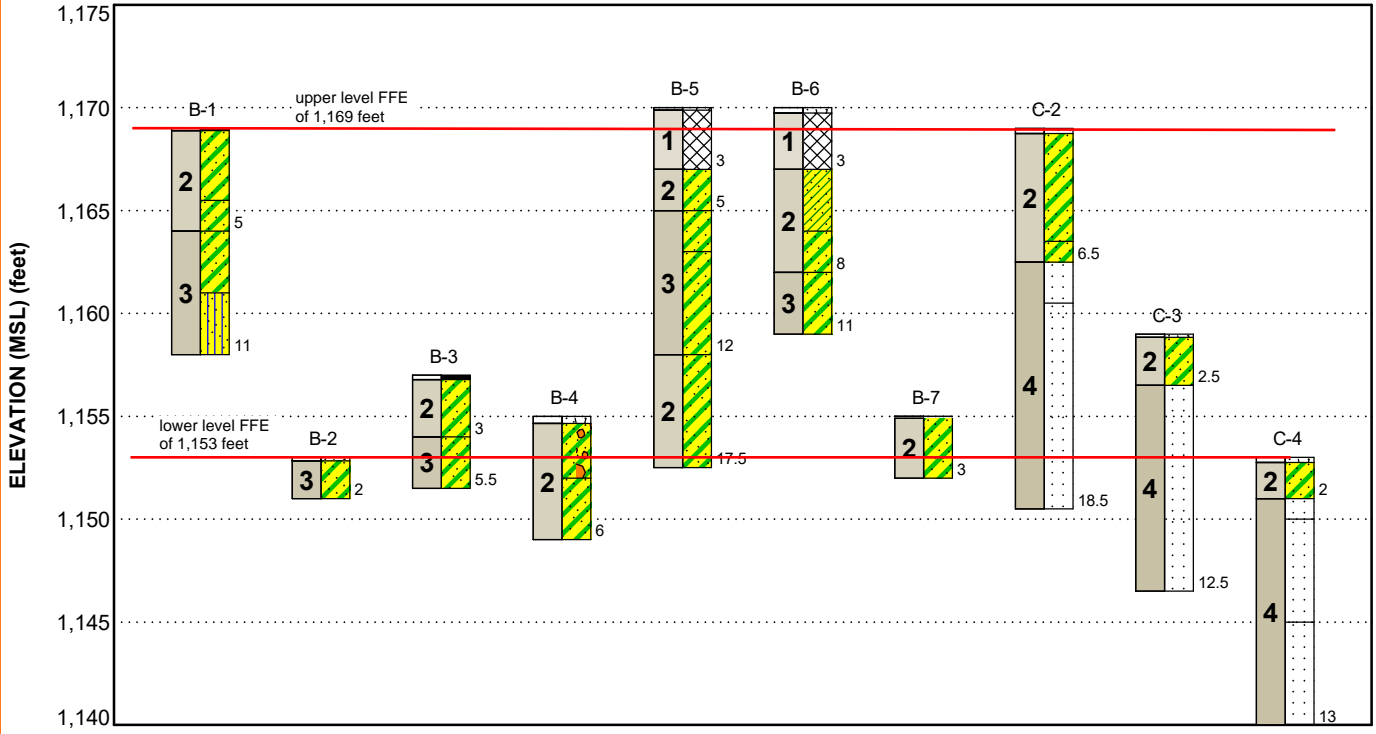
FIGURES

Contents:

GeoModel

GEOMODEL

Appalachian HS - Gym and Cafeteria Addition ■ Oneonta, AL
 Terracon Project No. E5215061



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Fill	Sand (SM, SC) Fill encountered at borings B-5 and B-6
2	Clayey Sand (SC) and Lean Clay (CL)	N values of 6 to 49 blows per foot (bpf) Typically red, tan, and/or gray in color
3	Very Dense Sands (SC, SM)	N values of 50 bpf or greater Typically red, tan, and/or gray in color Some interbedded layers of Fat Clay (CH) and/or Elastic Silt (MH, locally called "whitehorse" clay)
4	Weathered Sandstone	Typically tan, gray, light red, or pink in color. Highly weathered to slightly weathered, with poor to very poor RQD.

LEGEND

- Asphalt
- Topsoil
- Fill
- Clayey Sand
- Clayey Sand with Gravel
- Sandy Lean Clay
- Silty Sand
- Base
- Sandstone

NOTES:
 Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Exploration Points	Exploration Depth (feet) ¹	Location
SPT Borings: 7 (B-1 to B-7)	Auger Refusal at depths ranging from 2 to 17½ feet (refusal)	Building Addition, see exploration plan
Rock Cores: 3 (C-2 to C-4)	Auger Refusal plus 10-12 feet of rock coring	Building Addition, see exploration plan

1. Below ground surface

Boring Layout and Elevations: Terracon personnel provided the exploration layout with the use of a GPS application (estimated horizontal accuracy of about ±20 feet) and cross-referencing surface features. Approximate elevations were obtained from Google Earth. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a trailer-mounted rotary drill rig using continuous flight augers (solid stem and/or hollow stem, as necessary, depending on soil conditions). Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. Rock coring was accomplished using NX/NQ core barrel drilling methods. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer.

Our exploration teams prepared boring logs in the field. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final exploration logs were prepared from the field logs. The final exploration logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of samples in our laboratory.

Geotechnical Engineering Report

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Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D2938 Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location

Exploration Plan

SITE LOCATION

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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY GOOGLE



EXPLORATION PLAN

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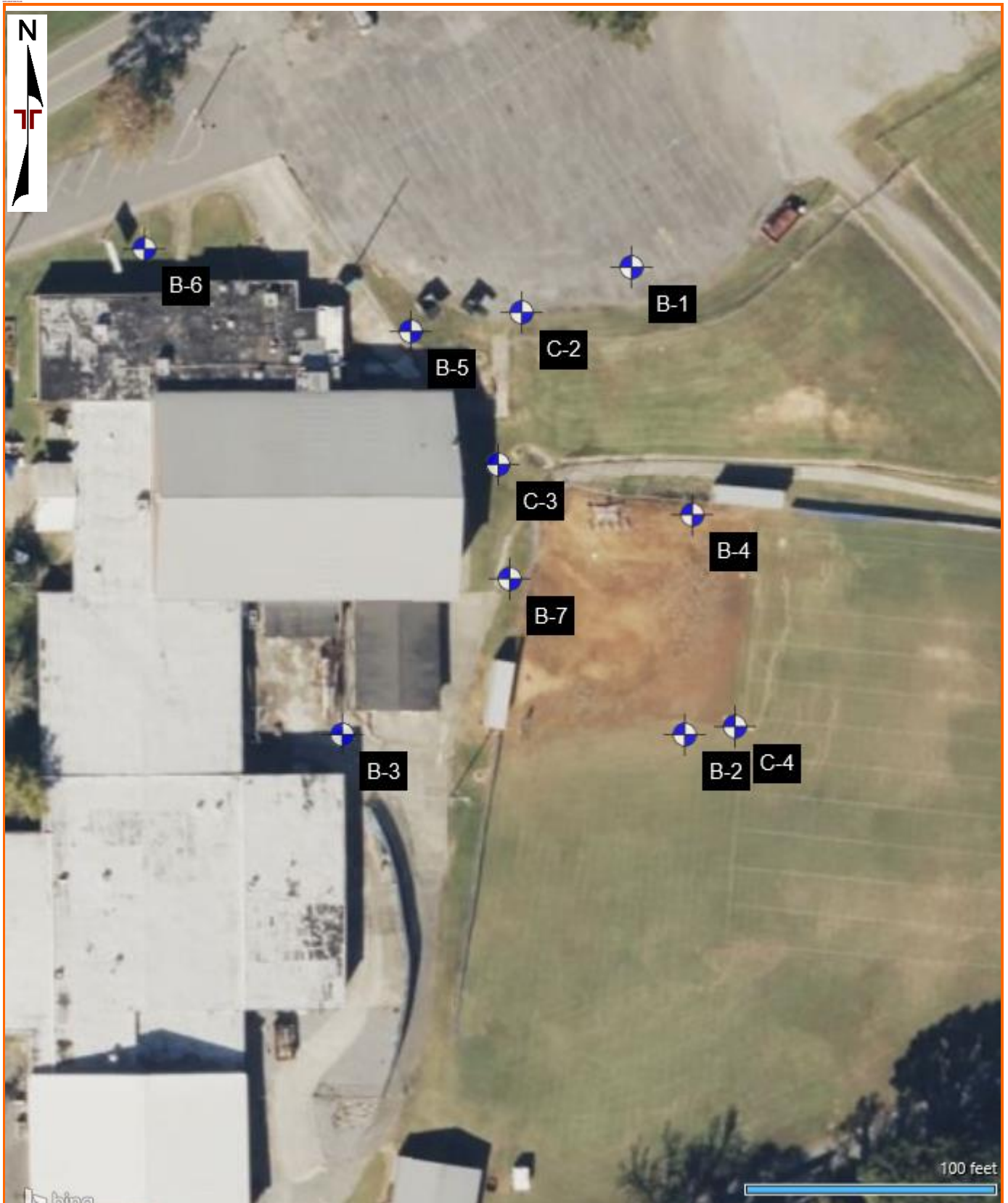


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (B-1 to B-7, C-2 to C-4)

BORING LOG NO. B-1

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8886° Longitude: -86.3965° Surface Elev.: 1169 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
		0.1' ASPHALT BASE 1.5"	1169								
2		CLAYEY SAND (SC) , red and tan, loose			X	2-2-4 N=6					
		3.5' CLAYEY SAND (SC) , red and tan, medium dense	1165.5								
		5.0' CLAYEY SAND (SC) , red, tan, and gray, very dense	1164			X					
		8.0' SILTY SAND (SM) , reddish tan and gray, very dense	1161			X	10-15-50/4"				
3		11.0' Auger Refusal on Weathered Sandstone at 11 Feet	1158			X	23-50/2"				

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Groundwater not encountered



Boring Started: 09-24-2021

Boring Completed: 09-24-2021

Drill Rig: CME 45

Driller: Earthcore

Project No.: E5215061

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

BORING LOG NO. B-2

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8881° Longitude: -86.3965° Surface Elev.: 1153 (Ft.) DEPTH _____ ELEVATION (Ft.) _____	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
3		0.2' TOPSOIL CLAYEY SAND (SC), red and tan, very dense, whitehorse 2.0' Auger Refusal on Weathered Sandstone at 2 Feet	1153 1151		X	5-50/3"					

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Groundwater not encountered



Boring Started: 09-24-2021

Boring Completed: 09-24-2021

Drill Rig: CME 45

Driller: Earthcore

Project No.: E5215061

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

BORING LOG NO. B-3

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8881° Longitude: -86.3969° Surface Elev.: 1157 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										DEPTH	ELEVATION (Ft.)
		0.2' ASPHALT BASE 2.5"									
2		CLAYEY SAND (SC) , red and dark tan, loose			X	2-3-3 N=6					
		3.0' CLAYEY SAND (SC) , red and tan, very dense, whitehorse			X	4-6-50/5"					
3		5.5' Auger Refusal on Weathered Sandstone at 5.5 Feet	5								

Stratification lines are approximate. In-situ, the transition may be gradual.

<p>Advancement Method: Hollow Stem Auger</p>	<p>See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).</p> <p>See Supporting Information for explanation of symbols and abbreviations.</p>	<p>Notes:</p>						
<p>Abandonment Method: Boring backfilled with auger cuttings upon completion.</p>								
<p>WATER LEVEL OBSERVATIONS <i>Groundwater not encountered</i></p>	<p>220A Production Ave Madison, AL</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Boring Started: 09-24-2021</td> <td style="width: 50%;">Boring Completed: 09-24-2021</td> </tr> <tr> <td>Drill Rig: CME 45</td> <td>Driller: Earthcore</td> </tr> <tr> <td>Project No.: E5215061</td> <td></td> </tr> </table>	Boring Started: 09-24-2021	Boring Completed: 09-24-2021	Drill Rig: CME 45	Driller: Earthcore	Project No.: E5215061	
Boring Started: 09-24-2021	Boring Completed: 09-24-2021							
Drill Rig: CME 45	Driller: Earthcore							
Project No.: E5215061								

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

BORING LOG NO. B-4

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8883° Longitude: -86.3965° Surface Elev.: 1155 (Ft.) DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
		0.3 TOPSOIL 1154.5									
		CLAYEY SAND WITH GRAVEL (SC) , dark red, tan, and gray, medium dense				5-7-12 N=19					
2		CLAYEY SAND (SC) , tan and gray with some red, medium dense				6-8-10 N=18					
		6.0 Auger Refusal on Weathered Sandstone at 6 Feet 1149				50/0"					

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS
Groundwater not encountered



Boring Started: 09-24-2021

Boring Completed: 09-24-2021

Drill Rig: CME 45

Driller: Earthcore

Project No.: E5215061





THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

BORING LOG NO. B-5

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8885° Longitude: -86.3968° Surface Elev.: 1170 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
		DEPTH									
		0.1' BASE 1.5"	1170								
1		FILL - SILTY CLAY , reddish light brown				2-2-3 N=5					
		3.0	1167								
2		CLAYEY SAND (SC) , red and tan, medium dense				3-6-9 N=15					
		5.0	1165								
		CLAYEY SAND (SC) , red and tan, very dense, whitehorse				50/4"					
		7.0	1163								
3		CLAYEY SAND (SC) , tan and gray, very dense				50/4"					
		12.0	1158								
2		CLAYEY SAND (SC) , tan, gray, and red, dense				20-22-18 N=40					
		17.5	1152.5								
		Auger Refusal on Weathered Sandstone at 17.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:

Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Groundwater not encountered



Boring Started: 09-24-2021

Boring Completed: 09-24-2021

Drill Rig: CME 45

Driller: Earthcore

Project No.: E5215061

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

BORING LOG NO. B-6

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8886° Longitude: -86.3972° Surface Elev.: 1170 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
		DEPTH									
1		0.3 TOPSOIL FILL - CLAYEY SAND , some organics, red and dark tan	1170			1-2-2 N=4					
2		3.0 SANDY LEAN CLAY (CL) , red, tan, and gray, very stiff	1167			6-8-9 N=17					
		6.0 CLAYEY SAND (SC) , tan and gray, dense	1164			15-18-29 N=47					
3		8.0 CLAYEY SAND (SC) , reddish tan and gray, very dense	1162			50/5"					
		11.0 Auger Refusal on Weathered Sandstone at 11 Feet	1159								

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method: Hollow Stem Auger	See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any). See Supporting Information for explanation of symbols and abbreviations.	Notes:
Abandonment Method: Boring backfilled with auger cuttings upon completion.		
WATER LEVEL OBSERVATIONS <i>Groundwater not encountered</i>	 220A Production Ave Madison, AL	Boring Started: 09-24-2021 Drill Rig: CME 45 Project No.: E5215061
		Boring Completed: 09-24-2021 Driller: Earthcore

BORING LOG NO. B-7

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8883° Longitude: -86.3967° Surface Elev.: 1155 (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
2		TOPSOIL CLAYEY SAND WITH FAT CLAY LAYERS (SC) , red, tan, and gray, medium dense Auger Refusal on Weathered Sandstone at 3 Feet	0.0 3.0		X 3-5-7 N=12					
Stratification lines are approximate. In-situ, the transition may be gradual.										

Advancement Method:
Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
See [Supporting Information](#) for explanation of symbols and abbreviations.

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

WATER LEVEL OBSERVATIONS
Groundwater not encountered



Boring Started: 09-24-2021
Drill Rig: CME 45
Project No.: E5215061

Boring Completed: 09-24-2021
Driller: Earthcore

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

CORING LOG NO. C-2

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8886° Longitude: -86.3967° Surface Elev.: 1169 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
		0.3 BASE	1169								
2		CLAYEY SAND (SC) , red									
		5.5	1163.5								
		CLAYEY SAND (SC) , reddish tan Auger Refusal at 6.5 feet- Begin Rock Core									
		6.5	1162.5								
		POTTSVILLE FORMATION , completely weathered sandstone or shale, no recovery					0	0			
		8.5	1160.5								
		SLIGHTLY WEATHERED SANDSTONE , tan, gray, and light red, medium strong, fair RQD					82	50			
4		very poor RQD									
		18.5	1150.5				80	0			
		Coring Terminated at 18.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Groundwater not encountered



Boring Started: 08-09-2022

Boring Completed: 08-09-2022

Drill Rig: Mobile B-47

Driller: Earthcore

Project No.: E5215061

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CORING LOG NO. C-3

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8884° Longitude: -86.3967° Surface Elev.: 1159 (Ft.) DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
2		0.2 TOPSOIL CLAYEY SAND (SC) , tan	1159								
4		2.5 Auger Refusal at 2.5 feet- Begin Rock Core POTTSVILLE FORMATION, SLIGHTLY WEATHERED SANDSTONE , red, gray, pink, medium strong, very poor RQD	1156.5				75	4			
		12.5 Coring Terminated at 12.5 Feet	1146.5				80	22			

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Groundwater not encountered



Boring Started: 08-09-2022

Boring Completed: 08-09-2022

Drill Rig: Mobile B-47

Driller: Earthcore

Project No.: E5215061


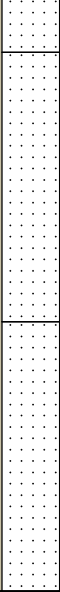
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

CORING LOG NO. C-4

PROJECT: Appalachian HS - Gym and Cafeteria Addition

CLIENT: Blount Co. Board of Education
Oneonta, AL

SITE: County Highway 12
Oneonta, AL

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.8881° Longitude: -86.3964° Surface Elev.: 1153 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY %	RQD %	WATER CONTENT (%)	ATTERBERG LIMITS	
										LL-PL-PI	
		DEPTH									
		0.3 TOPSOIL	1153								
2		CLAYEY SAND (SC) , red and tan	2.0								
		HIGHLY WEATHERED SANDSTONE									
		Auger Refusal at 3 feet- Begin Rock Core	3.0								
		POTTSVILLE FORMATION, SLIGHTLY WEATHERED SANDSTONE , tan, gray, medium strong, very poor RQD									
			5				88	15			
4		poor RQD	8.0								
			10				72	28			
			13.0								
		Coring Terminated at 13 Feet	1140								

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Continuous Flight Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

Groundwater not encountered



Boring Started: 08-09-2022

Boring Completed: 08-09-2022

Drill Rig: Mobile B-47

Driller: Earthcore

Project No.: E5215061

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_E5215061 APPALACHIAN HS - GPJ TERRACON_DATATEMPLATE.GDT 8/22/22

PHOTOGRAPHY LOG



The rock core was initiated at the top left corner



The rock core was initiated at the top left corner



The rock core was initiated at the top left corner

SUPPORTING INFORMATION












Contents:

General Notes

Unified Soil Classification System

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			WATER LEVEL		Water Initially Encountered	FIELD TESTS	(HP) Hand Penetrometer	
	Auger	Split Spoon			Water Level After a Specified Period of Time		(T) Torvane	
					Water Level After a Specified Period of Time		(b/f) Standard Penetration Test (blows per foot)	
	Shelby Tube	Macro Core		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.			(PID) Photo-Ionization Detector	
							(OVA) Organic Vapor Analyzer	
Ring Sampler	Rock Core							
								
Grab Sample	No Recovery							

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS	RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, tsf	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification			
				Group Symbol	Group Name ^B		
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F		
			$Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F		
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}		
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}		
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I		
			$Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	SP	Poorly graded sand ^I		
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}		
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}		
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A" line	CL	Lean clay ^{K, L, M}		
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K, L, M}		
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}	
			Liquid limit - not dried			Organic silt ^{K, L, M, O}	
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}		
			PI plots below "A" line	MH	Elastic Silt ^{K, L, M}		
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}	
			Liquid limit - not dried			Organic silt ^{K, L, M, Q}	
		Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$C_c = \frac{(D_{60})^2}{D_{10} \times D_{30}}$$

^E $Cu = D_{60}/D_{10}$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

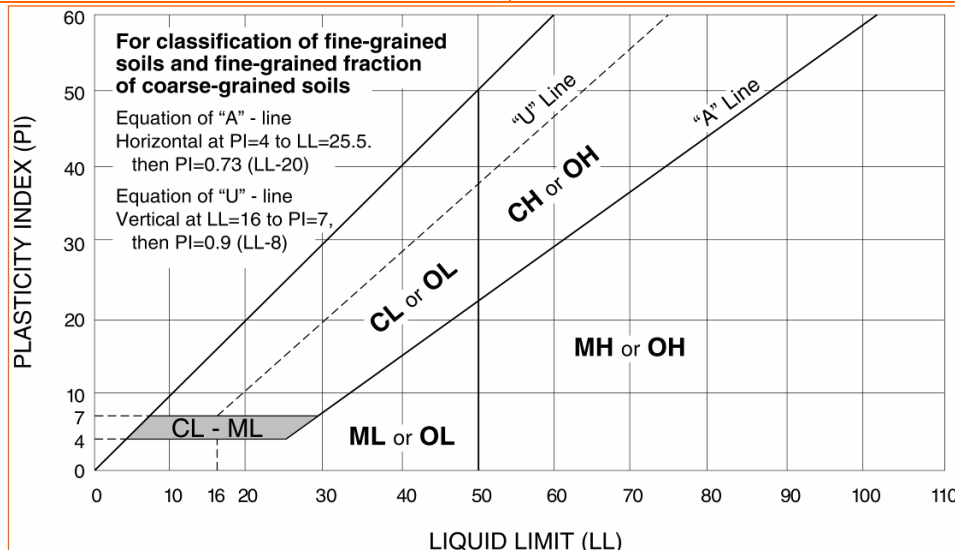
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



SECTION 02282 - TERMITE CONTROL

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 work of this section.

1.2 SUMMARY

- A. Provide soil treatment for termite control, as herein specified.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.

1.4 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.
- B. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.
- C. Use only termiticides which bear a Federal registration number of the US Environmental Protection Agency.

1.5 JOB CONDITIONS

- A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.
- B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 SPECIFIC PRODUCT WARRANTY

- A. Furnish written warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites and that if subterranean termite activity is discovered during warranty period. Contractor will re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION

- A. Use an emulsible concentrate termiticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of the following chemical elements and concentrations:
 - 1. Water based emulsion, uniform composition, synthetic dye to permit visual identification of treated soil, of a generic chemical type in compliance with state and federal law and regulations.
- B. Solutions as recommended by Applicator and approved for intended application by jurisdictional authorities. Use only soil treatment solutions which are not injurious to planting or persons.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under

slabs, if recommended by toxicant manufacturer.

- B. Application Rates: Water to be added to solution at job site in the presence of field Superintendent. Apply soil treatment solution at a rate as recommended by the manufacture at the following locations:
- C. Under slab-on-grade structures, treat soil before concrete slabs are placed, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab and around interior column footers.
- D. Apply chemical solution to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab and around interior column footers.
 - 1. Apply chemical solution as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply chemical solution to areas where fill is washed gravel or other coarse absorbent material.
 - 2. Apply chemical solution for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6" to 8" wide along outside of foundation to a depth of not less than 12". Punch holes to top of footing at not more than 12" o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench.
- E. Under crawl-space and basement structures, treat soil along exterior and interior walls of foundations with shallow footings as specified above for exterior of slab-on-grade structures.
- F. Treat soil under or around crawl-space structures as follows:
 - 1. Apply chemical solution along inside of foundation walls, along both sides of interior partitions, and around piers and plumbing. Do not apply an overall treatment in crawl spaces.
 - 2. Apply chemical solution for each foot of depth from grade to footing, along outside of foundation walls, including part beneath entrance platform porches, etc.
 - 3. Apply chemical solution along the side and outside of foundation walls of porches.
 - 4. Apply as an overall treatment, only where attached concrete platform and porches are on fill or ground.
- G. At hollow masonry foundations or grade beams, treat voids.
- H. At expansion joints, control joints, and areas where slabs will be penetrated, apply chemical solution.
- I. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs when areas are covered by other construction.
- J. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION

SECTION 02513 - ASPHALT PAVING PART

1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section of Specifications covers the material and installation requirements for asphalt patching over excavated trenches in roads, parking lots and driveways.
- B. This Section of Specifications covers material and installation requirements for asphalt overlay, asphalt full build-up in roads, parking lots, and driveways.

1.2 GENERAL INFORMATION

- A. Measurement for asphalt patching shall be the trench width as specified by Table 2 of AWWA C600 plus 2 feet. The trench width for utilities and utility services less than 4 inches shall be 2-feet. For valves and other fittings including the connecting piping for ties to other water mains or fire hydrants, the measurement shall allow 2-feet on all sides of the actual dimension of the fitting itself. (N/A - Lump Sum Contract)
- B. The average weight per square yard of plant mix to be placed is shown in the drawings. The Architect may direct in writing that the designated weight be increased or decreased in certain areas. It shall be the Contractor's responsibility to place and spread the material uniformly to such thickness as will produce the specified average weight per square yard, separately for each layer of base, binder, and surface, and to maintain a continuing check on tonnage and yardage throughout the day's operation to insure uniform specified weight.

If the average weight per square yard of any unit is found deficient by more than 10 percent of the specified average weight per square yard, the Architect will determine (1) whether the Contractor shall remove and replace the deficient unit without payment for the removal or the material removed, or (2) whether the Contractor may leave the deficient unit in place and cover it with a layer of the same mix of adjusted maximum size aggregate, of not less than 80 pounds per square yard average. In case (2), the surface layer shall not be featheredged at the end of the overlay layer, but a sufficient amount of the surface beyond the ends of the deficient unit shall be removed, to a neat line across the pavement, to allow placing the full 80 pounds per square yard and make a joint that will meet the surface requirements. The Contractor will be paid for the deficient layer plus as much of the 80-pound overlay as is needed to bring the total up to the designated average weight per square yard for that unit.

If the average weight per square yard placed for any unit is more than ten (10) percent in excess of the weight specified by the Architect, the amount over 110% shall not be paid for.

Measurement shall be taken from the actual width of paving in feet times the length of paving in feet divided by 9 to obtain square yardage. (N/A - Lump Sum Contract)

Measurement for asphalt leveling shall be taken from the actual truck weights with the weight tickets being furnished at the job site with each truck. Only tickets received on the day the asphalt is installed shall be accepted. (N/A - Lump Sum Contract)

1.3 REFERENCES

- A. State of Alabama Department of Transportation Standard Specifications for Highway Construction, Latest Edition.

1.4 QUALITY ASSURANCE

- A. The work of asphalt paving shall be accomplished by skilled workmen experienced in the laying of asphalt.
- B. All equipment shall be of a design and size to successfully accomplish the work.

1.5 PROJECT CONDITIONS

- A. The Contractor shall comply with all environmental laws and requirements pertaining to the work.
- B. The Contractor shall take adequate measures to control dust in the work area.
- C. The Contractor shall thoroughly inspect the backfilled trench and assure himself that proper laying conditions exist.
- D. The Contractor shall provide and maintain adequate and safe traffic control.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Prime Coat:
 - 1. Prime Coat shall be emulsified asphalt, Type AE-P, tar types RT2 or RT3, or cutback asphalts MC 250, RC70 or RC250 as defined in Section 804 of the Alabama Department of Transportation Standard Specifications.
 - 2. Prime Coat shall be applied at the rate of 0.22 to 0.25 gallons per square yard over the entire area to be treated with asphalt.
- B. Tack Coat:
 - 1. Tack coat shall be emulsified asphalt type SS-1, SS-1h, or RS-2 or Asphalt Cement Grade AC-10 or AC-20 as defined in Section 804 of the State of Alabama Department of Transportation Standard Specifications.
 - 2. Tack Coat shall be applied at a rate not to exceed 0.10 gallons per square yard.
- C. Asphalt Patch:
 - 1. Asphalt paving used in patching shall be Improved Bituminous Concrete Binder as defined in Section 424 of the State of Alabama Department of Transportation Standard Specifications.
 - 2. Materials shall meet the requirements of Article 424.02 of the above-mentioned specifications.
 - 3. The Contractor shall refer to the drawings for the quantity of material to be applied per square yard.
- D. Asphalt Paving:
 - 1. Asphalt paving used in paving shall be Improved Bituminous Concrete Plant Mix, meeting the specification outlined in Section 424 of the State of Alabama Department of Transportation Specifications.
 - 2. Asphalt final layer placed for paving and/or overlay in streets, parking lots, drives, and patches shall be Improved Bituminous Concrete Wearing Surface, Mix "A" and all materials used shall conform to Article 424 of the State of Alabama Department of Transportation Specifications.
 - 3. The Contractor shall refer to the drawings for the quantity of material to be applied per square

yard.

- E. Traffic striping and control markings shall conform to Sections 701 and 703 of the State of Alabama Department of Transportation Standard Specifications for Highway Construction. All striping, delineations, markers, etc., damaged or destroyed during the construction shall be replaced by the Contractor at his expense.
- F. Before overlaying the street, the Contractor shall raise or lower all valve boxes, manholes and other embedded items, including items that have previously been paved over. No extra payment will be made for these adjustments.

2.2 EQUIPMENT

- A. Equipment used in asphalt patching and/or asphalt paving shall meet the requirements of Article 410.03a of the State of Alabama Department of Transportation Specifications.
- B. Equipment used in the application of Prime Coat and Tack Coat shall comply with Article 401.03a of the above-mentioned Specifications.

2.3 TEMPERATURE AND WEATHER REQUIREMENTS

- A. Prime and Tack Coat:
 - 1. Bituminous materials shall not be placed on wet surfaces or when the air temperature is below 60-degrees F.
 - 2. Bituminous materials shall not be placed when the temperature is expected to fall below freezing during the night regardless of the daytime temperature.
- B. Asphalt Patching and Overlay:
 - 1. The asphalt mixture shall be placed only upon an approved underlying course that is dry.
 - 2. Asphalt layers of 200-pounds per square yard or less shall not be placed when the air temperature is below 40-degrees F. The air temperature must be 40-degrees F. and rising before the spreading operation is started and the spreading operation shall be stopped when the air temperature is 45-degrees F. and falling.
 - 3. For asphalt layers over 200-pounds per square yard, the above temperatures shall be lowered by 5-degrees.

PART 3 - EXECUTION

3.1 EXECUTION

- A. Prime and Tack Coat:
 - 1. All loose material, dust and foreign material shall be removed from the surface. Cleaning shall be continued until all caked and loose dirt and dust are removed.
- B. Asphalt Patching:
 - 1. All designated areas to be patched shall be trimmed to neat vertical lines to the depth of patch specified. All loose material shall be removed. A prime or tack coat shall be applied as specified above. The asphalt shall be placed and compacted to a degree that further consolidation of the patch is not anticipated.
 - 2. Any patched areas that do consolidate shall be replaced or additional material brought in to bring the patch up to the surrounding level.

3. All asphalt or concrete streets, parking areas and drives shall be patched the same day they are cut. Temporary or cold patch material may be used until the permanent patch can be placed; however, no extra payment will be made for temporary patching.
4. The Contractor shall delineate with construction warning signs (lighted at night) any "bump" and/or rough patch areas that will greatly impact the public until the patch is complete and smoothly graded with no settlement.

3.2 APPLICATION

A. Prime and Tack Coat:

1. Prime and Tack Coat shall be uniformly applied at the rate specified by pressurized distributors.
2. All areas to be treated with an asphalt surface treatment shall be primed and/or tacked.

B. Asphalt Patch and Overlay:

1. Asphalt patching may be applied with spreaders, by hand, or with motor graders. All areas inaccessible to large equipment shall be spread by hand.
2. Asphalt patching shall be thoroughly compacted through the use of steel wheeled rollers and/or rubber-tired rollers. Density shall be as specified in the drawings or in the State of Alabama Department of Transportation Standard Specifications.
3. Asphalt paving overlay shall be applied with spreaders; except in inaccessible areas spreading may be done by hand, uniformly placing the desired rate per square yard over the underlying surface.
4. As soon as the mixture has set sufficiently to prevent cracking, the mixture shall be rolled with steel wheel and rubber-tired rollers to compact the mixture. Density shall be as specified in the drawings.

3.3 TESTING AND SURFACE REQUIREMENTS

- A. Testing of the asphalt mixtures shall be performed at the discretion of the Architect. Testing shall include but not be limited to density tests and extraction tests.
- B. The finished surface of asphalt overlays shall be checked with string, level and/or straightedge. The finished surface shall not vary more than 1/4" from the required sections as measured at right angles to the roadway centerline. The finished surface shall not vary more than 3/8" in any 25-foot section measured parallel to the centerline at the following locations: one foot inside of the edges of pavement, at the centerline and at other points as designated.

3.4 MAINTENANCE

- A. The contractor shall maintain and protect the newly laid asphalt until final acceptance of the work.

END OF SECTION 02513

SECTION 02514 - PORTLAND CEMENT CONCRETE PAVING

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of Portland cement concrete paving work is indicated on drawings.
- B. Paving work includes, but is not limited to the following:
 - 1. Walks.
 - 2. Ramps.
 - 3. Steps.
 - 4. Mechanical Pads.
- C. Prepared subgrade is specified in Specification Section: "EARTHWORK".
- D. Concrete and related materials are specified in Division 3 Specifications.

1.3 QUALITY ASSURANCE

- A. Referenced Standards: Where the term "Referenced Standard" is used in these Project Specifications, it shall be interpreted as **referring to the current edition of "Standard Specifications for Highway Construction" 2018 or latest edition of Alabama Department of Transportation**. Referenced Divisions of the "Standard" are hereby made a part of this Project Specification insofar as they may be termed applicable. In no case will requirements for "Method of Measurement" and "Basis of Payment" be considered as applicable to this Project Specification.
- B. Testing and Inspection:
 - 1. Testing and Inspection Services: The **Owner** will engage and pay for testing and inspection services, to include testing soil materials proposed for use during paving operations.
 - 2. Field tests will be performed in conjunction with a proof rolling inspection of the prepared subgrade to verify that existing subgrade conditions are similar to those assumed in the design and therefore adequate for support of the pavement system.
- C. Do not change source or brands of material during the course of the work.

1.4 INSPECTION AND APPROVAL OF WORK

- A. Before commencement of work, Contractor shall coordinate with the Architect to arrange for inspection and approval of initial installation of slabs-on-grade. The approved initial installations shall serve as the standard to which all subsequent work shall adhere.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT CONCRETE

- A. Dumpster Pad: After subgrade is approved, place 6" of 4000 psi concrete (550 psi flexural strength) at the dumpster pad and place 6" of 4000 psi concrete at a 20' approach apron in front of the dumpster pad.
- B. Curbs: shall be constructed to details shown on the drawings with uniform slopes for drainage as indicated, providing for expansion joints at 10' intervals. Form all radii as shown and tool exposed edges of all curbs.
- C. Concrete walks:

1. Concrete walks shall be poured 4" thick with expansion joints every 30 feet **MAXIMUM**.
 2. Provide sawn joints 1/4" wide x 3/4" deep where indicated on drawings.
 3. Score walks with tool every 6' or as indicated on drawings.
 - a. Contractor may also use sawn joints at locations indicated to be scored.
 4. Light broom finish all walks.

Pitch 2% Maximum, 1% Minimum to side for surface drainage.

Concrete walks shall be reinforced with 6 x 6 #10/10 mesh unless noted otherwise.

 - a. Contractor may use fiber mesh reinforcement in lieu of wire mesh at walks.
- D. Pad for Condenser or Transformer: 4" thick concrete slab installed over compacted bed. Edges neatly tooled. Verify exact elevation, size and location with HVAC and/or electrical contractor and architect.

2.2 MATERIALS - CONCRETE

1. Concrete shall be plant or transit mixed having a minimum of 28 day strength of 4000 psi (550 psi flexural strength), maximum 4" slump. Proportioning and control of the mix shall be as required under the concrete section of these specifications.

2.3 MATERIALS - REINFORCING

1. Fiber Reinforcement:
 - a. Fiber Force 500 (Fibril Pro) Micro synthetic Fiber Reinforcement by ABC Polymer Industries or Equal.
 - b. Add to concrete mix at 1.5 pounds per cubic yard of concrete.
 - c. Finishing: Broom finish; pull broom in one direction such that fibers lay down.
 - d. Locations for Use: All concrete sidewalks, paving and handicap ramps.
2. Steel reinforcement if required shall be 6 x 6 #10/10 W.W.M. unless noted otherwise.
3. Expansion joint material shall be premoulded treated fibre 1/2" thick.

PART 3 – EXECUTION

3.1 CONCRETE FORMWORK

- A. Execute construction of concrete formwork in accordance with the "Referenced Standard".

3.2 CLEANING UP

- A. Remove all surplus materials, rubble, cartons and other debris resultant from work of this Section and haul off site. Repair damage resulting from paving operations. Leave entire work in broom-clean condition.

END OF SECTION

SECTION 02515 - CONCRETE CURB AND GUTTER

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Concrete curb and gutters, valley gutters and other curbing, shall be constructed to the shape and cross-sections as shown on the detail drawing.
- B. Curb and gutters, valley gutters, etc., shall be placed on material meeting or exceeding the requirements of the processed roadbed or base material underlying adjacent paving.
- C. Concrete for all curbing shall be a minimum of 3000 psi and meet the requirements of the concrete specifications.
- D. All curb, curb and gutter, valley gutter, etc., shall have hand-tooled joints during the initial pour, and after setup the joints shall be saw-cut to provide the necessary depth joint (1/4 thickness of concrete)

1.2 FORMS

- A. Contractor shall use standard type metal forms for all curbing except where noted.
- B. Forms shall be straight and free from warps and adequately braced to insure no moving during concrete placement.
- C. Where short radii occur forms may be constructed of wood and bent to form the proper curvature, if approved by the Architect. All wood forms so used shall provide the required shape and cross-section as the standard metal forms.
- D. Hand forming and pouring of curbing shall be of the highest quality. This pertains to areas where the Contractor makes tie-ins or pours curbing, valley gutter, etc., in decorative locations where machine curb is not possible. High quality will be considered consistent, straight pours, with almost no waving, depressions, or deviations in the general shape of the curb, gutter, etc., required as shown on the Standard Details in the drawings. Low quality, non-aesthetically pleasing concrete work shall be removed and reinstalled at the Contractor's expense.

1.3 MACHINE CURBS

- A. Machine curbs are acceptable where approved in writing by the Owner's Representative.
- B. Approval by the Owner's Representative will require a field demonstration of the acceptability of the machine to be used.

1.4 PROTECTION OF CURBS

- A. The Contractor shall be fully responsible for the protection of all curb and gutter sections until final acceptance of the work.
- B. Any damaged, misaligned, or otherwise unacceptable section of curb and/or curb and gutter combination shall be replaced at no cost to the Owner.

END OF SECTION 02515

SECTION 02660 – WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. This section of specifications shall cover the testing, disinfection and general installation requirements for a potable water system and/or line.

1.2 RELATED SECTIONS:

1.3 REFERENCES:

- A. AWWA C300 AWWA Standard for Hypochlorites
- B. AWWA C301 AWWA Standard for Liquid Chlorine
- C. AWWA C600 AWWA Standard for the Installation of Ductile Iron Water Mains and their Appurtenances.
- D. AWWA C651 AWWA Standard for Disinfecting Water Mains
- E. AWWA C900 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.

1.4 SYSTEM REQUIREMENTS:

- A. The Contractor shall furnish a complete and operable water system, installed according to the standards and accepted practices for waterline construction. These specifications and references specifically called for in these specifications shall be considered minimum, other incidental items may be necessary to construct a complete and operable water system.
- B. The water system shall be free of leakage as defined in Section 332660, Part 3.2, Paragraph B.6 and ready for use by the Owner upon final acceptance.

1.5 REGULATORY REQUIREMENTS:

- A. The Contractor shall familiarize himself with the regulatory requirements of the following governing agencies. Any deviations specified in these specifications from these agency requirements shall be promptly brought to the attention of the Architect.
 - 1. Alabama Department of Environmental Management
 - 2. Local Water Works Department
 - 3. American Water Works Association

1.6 SITE CONDITIONS:

- A. The Contractor shall familiarize himself with the existing conditions and special site requirements of the job.
- B. Any street cuts or crossings shall be coordinated with the Owner and/or Owner's Representative. Any and all traffic control measures specified shall be incorporated by the Contractor.

- C. Street cuts or crossings along or across State of Alabama Department of Transportation Right-of-Way shall follow the guidelines and requirements of the Alabama Manual on Uniform Traffic Control Devices.
- D. The Contractor shall contact the Local Authority Water Works Department concerning the use of water to be used in the flushing, pressure testing, and disinfection if project is associated with the Local Authority Water System.
- E. The Contractor shall take appropriate measures to control the disposal of water used in the testing, flushing and disinfection of water lines. The Contractor shall adequately protect streets and adjacent property from the discharge of this water. Any damages shall be borne by the Contractor. Water used for disinfection may contain high concentrations of chlorine. Any environmental damage to lakes or streams shall be the sole responsibility of the Contractor.
- F. The Contractor shall coordinate with the Architect and water works officials on the timing of all tests, flushing and disinfection of all water lines.
- G. The Contractor shall coordinate with the Architect and water works officials on all tie-ins to existing system lines and valves.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. All manufacturers of equipment used in the water line and/or system shall be experienced in the manufacture of such equipment for the water industry.
- B. Equipment of like nature shall be of the same manufacturer as to maintain standardization of operation, maintenance, spare parts and manufacturer's service.

2.2 EQUIPMENT AND MATERIALS:

- A. All equipment used in the water system shall be new and unused, first quality and from established manufacturers.
- B. Equipment shall meet the requirements of the related sections of these specifications and associated governing agency.

2.3 TESTING EQUIPMENT:

- A. The Contractor shall have on hand proper testing apparatus and associated accessories prior to beginning any tests. All fittings, piping, pressure gauges and pumps shall be in proper working order.

PART 3 - EXECUTION

3.1 THRUST BLOCKING:

- A. All pressure pipes 2-inches in diameter and over shall be provided with thrust restraints. Thrust restraints shall consist of concrete thrust blocks and/or mechanical restraining rods and attachments shall be furnished at all hydrants, valves, fittings, plugs, and pipe bends.
- B. The bearing area for concrete thrust blocking shall conform to the tables shown on the

standard details. Special blocking detailed in the drawings shall supercede these requirements.

- C. Concrete used in thrust blocking shall have a minimum compressive strength of 2000 psi in 28-days.
- D. The concrete blocking shall be placed in such a way to contain the thrust force and still maintain accessibility of the pipe and fittings for repair. Nuts, bolts, glands, etc. shall be free of concrete. No separate payment shall be made for concrete blocking or thrust restraint.
- E. Fire hydrants shall be restrained as detailed on the drawings.
- F. All restraining rods, clamps, and accessories shall be coated with a bitumastic coating before and after installation. The surface shall be cleaned thoroughly and the bitumastic coating applied as per manufacturer's recommendations.

3.2 TESTING:

A. Flushing:

- 1. Prior to beginning the pressure test, the water line shall be flushed to remove any dirt and debris trapped in the line. All valves shall be partially opened and closed during the flushing process.
- 2. All mains shall be flushed with a velocity of at least 2.5 feet per second as specified by the Alabama Department of Environmental Management.

B. Hydrostatic Pressure Test:

- 1. The Contractor shall coordinate with the Owner and slowly fill the section of line to be tested with water. The line shall then be pressurized to 1.5 times the working pressure of the line, but in no case less than 150 psi. The working pressure shall be as defined by the Owner.
- 2. Trapped air shall be expelled at all valves and hydrants. High points in the line without access to a valve or hydrant shall be tapped and a corporation stop installed. Upon completion of the test, the corporation stop shall be left in place. A copper line shall be installed from the corporation stop to a curb stop and a meter box installed.
- 3. Upon complete removal of all air entrapped in the line, the line shall be again filled with water and pressurized and testing begun. Duration of the test shall be (2) two hours for uncovered pipe and (6) six hours for covered pipe. The test pressure shall not vary by + or - 5 psi during the duration of the test.
- 4. A recording pressure gauge shall be installed and pressure fluctuations recorded for the duration of the test. Test charts and records shall be available to the Engineer at the end of each test.
- 5. All visible leaks encountered during testing shall be repaired.
- 6. Leakage shall not be greater than determined by the following formula:

$$L = \frac{(S)(D)(P^{1/2})}{148,000}$$

L = Leakage in gallons per hour

S = Length of tested pipe (ft.)

D = Diameter of pipe (in.)

P = Average test pressure during the duration of the test (P.S.I.)

7. A meter shall be used during the duration of the test to determine if the volume of water required to maintain test pressure exceeds the total allowable leakage.
8. Leakage in excess of that determined by the above formula shall be repaired at the expense of the Contractor. The leakage test shall then be repeated until the project complies with the allowable leakage.

C. Disinfection:

1. After a successful pressure test has been achieved, the waterline shall be chlorinated for the purpose of disinfection.
2. The Contractor shall use the hypochlorite continuous feed method for chlorine application as specified in AWWA Standard C651.
3. Chlorine solution shall be introduced to achieve a concentration of at least 50 mg/l in all parts of the line.
4. The chlorine solution shall be allowed to remain in the pipe for a period of not less than 24-hours at which time the chlorine concentration shall be not less than 25 mg/l.
5. All pipe and appurtenances shall be flushed with clean water until the chlorine residual is reduced to 1 mg/l or less until compatible with the existing system. The Contractor shall not flush any lines unless the local Water Department is present.
6. Bacteriological samples shall be collected in sterile jars by the Contractor.
7. The Contractor shall perform the water analysis and provide results and/or reports to the Owner and Owner's Representative for review and final approval by the Local Authority. All costs associated with the disinfection shall be borne by the Contractor, except sample collection and analysis for one set of sampling which shall be paid for by the Owner.
8. The water line and appurtenances shall not be placed in service until an acceptable laboratory analysis has been completed.
9. If the initial disinfection fails to produce satisfactory samples, disinfection as required above shall be repeated by the Contractor at his expense until satisfactory samples have been obtained.

3.3 EXISTING UTILITY CROSSINGS:

- A. Water mains paralleling existing sanitary sewers shall be positioned a minimum of 5-feet horizontally from the sewer.
- B. If insufficient space is available to maintain the 5-foot separation, the bottom of the waterline shall be placed a minimum of 18-inches above the top of the sewer.

3.4 PROTECTION:

- A. The Contractor shall maintain and protect the completed water line until final acceptance by the owner. Any damages to the line shall be repaired by the Contractor prior to acceptance.

END OF SECTION 02660

SECTION 02720 - STORM SEWERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section shall cover the work of furnishing and constructing storm sewers of the kind, strength, and size pipe provided in the drawings in accordance with the requirements of these specifications and installing such sewers at the location shown on the drawings or designated and in conformity with established lines and grades. These items shall also include the furnishing and construction of such joints necessary, cutting and connections to other pipe, catch basins, in-walls, etc., and may be required to complete the work shown on the drawings or as directed.

1.2 PRODUCTS

- A. Materials:
 - 1. Concrete Pipe: All pipe material shall be reinforced concrete pipe, Class III, Class IV, and Class V, conforming to ASTM C-76 Specifications, minimum. Pipe extensions shall be of the type and class of piping being extended.
 - 2. Plastic Pipe: All plastic pipe shall be as shown in the plans, PVC or HDPE (High Density Polyethylene) storm sewer pipe, double walled, smooth inner wall, bell and spigot joints, and rubber O-rings, conforming to ASTM F-477.
 - 3. Pipe Extensions: Pipe extensions shall be of the type and class of piping extended.

1.3 EXECUTION

- A. Trenches: The trench shall be excavated beginning at the outlet end and proceed upgrade true to the established line and grade. Trenches shall be properly sheeted and braced wherever needed and conform to Section 312250 of these Specifications and trench standard details in the drawings.
- B. Pipe Laying: The laying of pipes and finished trenches shall be started at the outlet end and proceed upgrade so that the spigot or groove ends point in the direction of the flow. All pipe shall be laid with ends abutting and with not more than one inch variation from established alignment at the vertical center line or from grade at the flow line. The bottom of the trench shall be shaped accurately to the outside surface of the pipe for a depth of at least 1/10 of the outside diameter. The pipe shall be fitted and matched so that when laid in the work, they will form a sewer with a smooth uniform invert. Hubs or bells shall be carefully cleaned before pipes are lowered into the trenches. Pipes shall be so lowered as to avoid damage and unnecessary handling in the trench.
- C. Sealing Joints: Joints shall be sealed with mortar, bituminous plastic cement, rubber type gaskets or other type sealers that may be approved. Joints shall be thoroughly cleaned before being sealed and shall be sealed for the full circumference of the joint unless otherwise directed.
- D. Backfilling: All trenches and excavation shall be bedded and backfilled as shown on the drawings. Backfilling shall not begin until mortar joints have cured or until backfilling is authorized by the Architect.

1.4 CONSTRUCTION STAKING

- A. It shall be the responsibility of the Contractor to provide all construction staking.

END OF SECTION 02720

SECTION 02725 – PRECAST CONCRETE MANHOLES AND COVERS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. This section of specifications covers the material and installation requirements for precast concrete manhole sections with tongue-and-groove joints, masonry transition to manhole frame, covers, anchorage and accessories.
- B. The testing requirements for materials, in-place, specified under this section shall conform to Section 332722 – Sanitary Sewer System.

1.2 RELATED SECTIONS:

- A. Section 312250 – Trenching, Backfill and Compaction
- B. Section 332722 – Sanitary Sewer System

1.3 REFERENCES:

- A. ASTM A48 – Standard Specification for Gray Iron Castings.
- B. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- C. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections.
- D. ASTM C923 - Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
- E. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.4 QUALIFICATIONS:

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum of five years documented experience.

1.5 ENVIRONMENTAL REQUIREMENTS:

- A. Masonry construction shall not be performed when ambient temperatures are 40-degrees F. and falling unless provisions for heating and protecting the work are approved. Protect new masonry from freezing for 48-hours after completion of the masonry work.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Precast Manhole Base and Sections:
 - 1. All precast manholes shall be new, unused manholes delivered directly from the manufacturer to the job site. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the outside of the barrel.
 - 2. Precast concrete manholes shall be of reinforced concrete manhole sections

- conforming to the requirements of ASTM C478. The concrete when tested in compression shall not be less than 4000 psi and absorption shall not exceed 9%.
3. Precast manhole base and sections shall be a minimum of 48-inches inside diameter. Precast manhole base shall have a minimum wall thickness of 5 inches and minimum bottom thickness of 6 inches. Minimum wall thickness of the manhole riser sections shall be 5 inches for 48" I.D. sections, 6 inches for 60" I.D. sections, and 7 inches for 72" I.D. sections.
 4. Manhole base riser, riser, transition, and cone sections shall have offset tongue and groove joints and shall be made watertight with prelubricated rubber gaskets conforming to ASTM C443 and butyl sealant waterstops. Pre-lubricated gaskets shall be Tylox Superseal as manufactured by Hamilton-Kent; butyl sealant waterstop shall be Conseal CS-231, in widths as recommended by the manufacturer.
 5. Manholes shall be assembled with the fewest number of sections to makeup the required height, thereby reducing the number of joints. The use of more than one riser section of 16 inches or less shall be prohibited. The Engineer may require that any manhole not composed of the minimum number of sections be replaced.
 6. Precast eccentric cone shall be provided at top section of manhole. Eccentric cone shall have the same reinforcing as manhole base and sections. Cone sections shall be made with a minimum 5-inch wall thickness at the bottom and 8-inch wall thickness at the top. Where watertight manhole frame and covers are indicated on the drawings, cone sections shall be supplied with four (4) stainless steel anchor bolts.
 7. Two lift holes shall be cast into each cone or riser section for purposes of handling and placement.
 8. Openings for inlet and discharge sewer pipes shall be provided in the manhole base section and in the riser section for drop manholes. Openings shall be at positions and elevations as indicated on the plans, and may be cast into the manhole wall or mechanically cored at the manufacturing facility. Openings shall be sized to accommodate the flexible manhole sleeve.

B. Precast Concrete Adjusting Rings:

1. Provide precast concrete adjusting rings, as required, between top of eccentric cone and finished grade.
2. Precast concrete adjusting rings shall be of same materials of construction as manhole bases and sections, grooved top and bottom.
3. Adjusting rings shall be 3 or 4 inches high by 5 inches thick. Maximum combined height of adjustment rings shall be limited to 8 inches.

C. Flexible Manhole Sleeves:

1. Flexible manhole sleeves suitable for use in precast or cored openings utilizing premolded shapes positioned with expansion rings shall comply with the requirements of ASTM C923 and shall be manufactured by Kor-N-Seal or approved equal. Flexible connectors shall be installed as recommended by the manufacturer.

D. Manhole Steps:

1. Manhole steps shall be Copolymer Polypropylene Plastic Coating over 1/2-inch minimum Grade 60 steel reinforcing, 12-inches wide, with slip resistant surface.
2. Manhole steps shall conform to ASTM C478 as manufactured by M.A. Industries, Model PSI-PF, or equal. Steps shall be centered under the manhole cover opening and be vertically aligned on 16-inch centers.

E. Manhole Frames and Covers:

1. Manhole frames and covers shall be close-grained, cast-iron, smooth, clean, free of blisters, blowholes and other defects and conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure a flat, fine surface. Castings judged to be defective by the Owner or Engineer will be rejected and shall be replaced by the Contractor.
2. Covers and frames shall be "Heavy-Duty" type, rated for a minimum of H-20 loading. Covers and frames shall be made in the United States.
3. Manhole covers shall be cast with two non-penetrating type pick holes. Covers shall not have vent holes.
4. Manhole frames and covers shall be of either Standard Type (non-bolted) or Watertight Type (bolt-down), as indicated on the drawings. If not indicated, manhole covers shall be standard type. In locations where the manhole rim elevation is below the 100-year flood elevation, manhole frame and covers shall be Watertight Type.
5. Manhole frames and covers shall conform to the manufacturer dimensions required by Blount County and shown on the Drawings.
6. When watertight frames are required, manhole joints shall be supplied with 3" x 16" x 1/2" bitumastic-coated steel strap anchors and bolts as shown on the Drawings.

F. Non-Shrink Grout

1. Non-shrink grout shall be used to seal openings in the manhole base and riser sections such as lift holes and around flexible sleeve connections as shown on the standard details. Non-shrink grout shall be MasterSeal 590 or approved equal.
2. Surface preparation, mixing and application shall strictly adhere to manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL:

- A. Perform excavation to lines and grades established by the Drawings. Construct excavation a minimum of two (2) feet in diameter larger than the outside dimensions of the manhole base and sections.
- B. If material in bottom of excavation is unsuitable for supporting manhole, excavate unsuitable material to a depth specified by the Engineer and backfill resulting void with Alabama Department of Transportation No. 57 crushed limestone.
- C. Backfill around manholes constructed in paved areas or areas to be paved with Alabama Department of Transportation 825, Type "A". Compact backfill in 8-inch loose lifts to minimum density of 95% Standard Proctor Density with vibratory compaction equipment.
- D. Backfill around manholes in unimproved areas and lawns with native materials, compacted in 8-inch loose lifts to minimum density of 95% Standard Proctor Density.

3.2 GRANULAR BASE:

- A. Remove standing water from excavation. Place 12-inches minimum of Alabama Department of Transportation #57 stone and compact with vibratory compaction equipment.

- B. Excavations deeper than 12-inches below required grade of manhole base, not approved by the Engineer, shall be filled with Alabama Department of Transportation No. 57 crushed limestone and compacted by vibratory compaction equipment at no additional cost to the Owner.

3.3 PLACING MANHOLE BASE AND SECTIONS:

- A. Manholes shall be constructed to the sizes, shapes, dimensions, and at the locations shown on the plans.
- B. Precast manhole bases shall be set plumb and true to the lines and grades specified by the plans. Manholes out of plumb in excess of 1/4-inch in eight (8) feet shall be reset.
- C. Clean ends of manhole sections of foreign materials and inspect ends for damage.
- D. Place prelubricated gasket into recess. Place butyl sealant waterstop. Follow gasket and waterstop manufacturers' installation instructions. Set manhole section.
- E. When new openings are required in existing manholes, openings shall be core drilled.
- F. Install flexible manhole sleeves on pipes at the precast or core drilled openings according to manufacturer's recommendations. Grout around flexible sleeve as shown on the Drawings.
- G. Seal lifting holes and flexible manhole sleeves in manhole on the interior and exterior with non-shrink grout to divert infiltration.

3.4 MANHOLE INVERT:

- A. Manhole inverts shall be constructed of cement mortar and shall have the same cross-section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- B. For pipe diameters less than 48 inches, a bench shall be constructed on each side of the flow channel. The bench shall slope one (1) inch per foot. Bench shall be made of non-shrink grout.
- C. Where the difference in the invert elevation of two or more sewers 18-inches in diameter or smaller intersecting in one manhole is 2-feet or more, a drop manhole shall be constructed in the manner shown on the Drawings. They shall be similar in construction to the standard manhole except that a drop connection of pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by 3,000 psi concrete. The manhole and drop connection shall be placed on a 12-inch reinforced concrete foundation base. The drop connection piping assembly shall be bolted to the barrel of the manhole riser. Drop connection piping shall be ductile iron.
- D. When manholes are constructed over existing sewers and a full section of pipe is through manhole, break out top section of pipe and cover exposed edges of pipe with grout.

3.5 MANHOLE FRAMES AND COVERS:

- A. Install manhole frames and covers with top surface adjoining surrounding grade in improved

areas, or 18 inches above grade in unimproved areas. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted so as to conform to the exact slope, crown and grade of the existing pavement adjacent thereto. Set manhole frames at the required elevation in a full bed of grout for provide proper bonding to cone section and/or concrete adjusting rings.

- B. Where manhole frame elevation requires adjustment, precast concrete adjusting rings shall be used. A minimum 1/4-inch bed of non-shrinking grout shall be placed between the manhole cone section and the adjusting ring. Same grout thickness shall be provided in between adjusting rings when multiple rings are necessary. Butyl sealant waterstop shall be placed beneath the frame and in between each concrete adjusting ring as shown on the drawings. Butyl sealant shall be Conseal CS-231.
- C. Manhole frame shall be positioned concentrically above the precast cone section or adjusting rings and set in a full bed of non-shrink grout. A thick ring of non-shrink grout extending to the outer edge of the precast cone section or adjusting ring shall be placed all around and on top of the manhole frame. The non-shrink grout shall be smoothly finished and have a slight slope to shed water away from the frame and cover.
- D. Check manhole cover for fit in frame. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or moves in the frame, the frame and cover shall be removed and replaced by the Contractor.

3.7 MANHOLE HEIGHT ADJUSTMENT:

- A. Adjust height of existing manholes at locations shown on the Drawings. Height adjustment may include lowering or raising the existing manhole.
- B. For manholes located in the roadway or sidewalk, height shall be adjusted such that the rim and cover are flush with the proposed pavement or concrete. For manholes located in non-paved areas, height shall be adjusted such that the rim and cover are 6" above the proposed grade.

3.8 PROTECTIVE COATINGS:

- A. Where shown on the drawings or directed by the Engineer, manholes shall be protected from corrosion by the use of factory applied ceramic epoxy linings.
- B. Epoxy coating shall be an amide cured ceramic epoxy, Permite PCS-9043 Type II or approved equal. The epoxy shall be applied to a 40 mils dry film thickness on the inside of the structure per the manufacturer's recommendations.

END OF SECTION 02725

SECTION 02730 - SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. This section of specifications covers installation requirements of gravity sewer pipe and pressure sewer pipe. Testing requirements for gravity sewers, manholes, and force mains are also provided in this section.
- B. All materials used in the construction of sewers shall be new and unused when delivered to the job site and shall be suitable for installation and operation under the conditions for which they are to be used.

PART 2 – PRODUCTS

2.1 GENERAL:

- A. The Contractor shall provide all materials, equipment, and labor necessary to accomplish the work as shown or specified herein.

2.2 MATERIALS:

- A. All materials used in the construction of sewers shall be new and unused when delivered to the work and shall be suitable for installation and operation under the conditions for which they are to be used.
- B. All sewer pipe and materials used in its manufacture shall be tested and inspected by an approved commercial testing laboratory prior to delivery to the site and all materials which fail to conform to these specifications shall be rejected.
- C. After delivery to the site, any materials which have been damaged in transit or are otherwise unsuitable for use in the work shall be rejected and immediately removed from the site. Certified copies in duplicate of the inspection and acceptance reports of the testing laboratory shall be supplied to the Engineer prior to use of these materials.
- D. Each joint of pipe delivered to the work shall be stamped or marked to indicate the testing laboratory's acceptance or approval. The cost of inspecting and testing materials shall be borne by the Contractor, and the Engineer shall approve the Laboratory. The Engineer may require laboratory tests of other materials should he consider this necessary to get such materials to comply with the specifications.
- E. Certified mill test certificates will be accepted for PVC and DI pipe fittings.

PART 3 – INSTALLATION

3.1 GRAVITY SEWER PIPE LAYING - GENERAL:

- A. Before sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared and the necessary bracing and sheeting installed.
- B. Unless noted otherwise on the drawings, all gravity sewer lines shall be installed with a minimum thirty-six (36) inches of cover.

- C. A properly designed and operated laser beam device may be used to align and grade the pipe. Laser beam devices used shall be carefully calibrated at intervals not to exceed 30 calendar days.
- D. Air blowers must be used in conjunction with laser beam devices and must be sufficient to provide an air flow through the pipe of 4 to 6 mph.
- E. If approved by the Engineer, the batter board method may be used. A mason's line shall then be tightly stretched above ground level, parallel to and directly above the axis of the pipe to be installed; this line to be supported at intervals not exceeding 50 feet. The exact line and grade for each section of pipe shall be determined by measuring down from this line to the invert of the pipe in place. Each pipe shall be accurately placed to the exact line and grade called for on the plans. The Contractor shall furnish all labor and materials necessary for erecting batter boards.
- F. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the joints are completed or before the trench has been backfilled. The Contractor shall not open up at any time more trench than his available pumping facilities are able to dewater.
- G. Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in the trench. Pipe laying shall proceed up-grade, starting at the lower end of the grade and with the bells uphill.
- H. After pipe laying has begun, it shall continue progressively up-grade. No section of pipe installation will be skipped without a written request for such procedures from the Contractor and approved by the Engineer.
- I. Bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. Bell holes shall be cut not more than five joints ahead of pipe laying. The bottom of the trench and the crushed stone cushion between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets and inequalities in the flow line.
- J. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed and inspected by the Engineer.
- K. A metallic tape or wire shall be installed in the same trench with all non-metallic pipe (HDPE) in order that the pipe may be located with electronic metal detection equipment. Wire shall be T.W. 12-gauge solid copper conforming to specifications for annealed copper, ASTM B-3 and Underwriters Laboratories Thermoplastic Insulated Wire Standard No. 83, latest revision. Wire shall be Simplex BW3001, or equal. Pipe detector tape shall be two (2) inch wide minimum metalized tape. Tape shall be Griffolyn Company, Inc., Terratape 2" D., or equal. Wire and/or Tape shall be secured to pipe at intervals of 20 feet.
- L. Manholes shall be installed according to Section 332607 – Precast Concrete Manholes and Covers.

3.2 TESTING OF GRAVITY SEWERS AND MANHOLES:

- A. General:
 - 1. Shall be per the Local Authority Water and Sewer specifications. The approval and acceptance of gravity sewer lines and manholes shall be based on final testing. The

Contractor must provide a 72-hour notice prior to final testing to the City Engineer. A representative from the Engineer and/or Owner must be present to witness final testing procedures. Tests performed in the absence of the Engineer's and/or Owner's representatives shall be considered invalid and shall be repeated by the Contractor.

2. Final testing of gravity lines shall only be performed after all work adjacent to and over the pipeline has been completed. Trench backfilling, grading, roadway sub-grade, concrete work, other utility installation, and any other superimposed loads shall be completed and in place prior to final testing.
3. Prior to any testing and final inspection, all gravity lines shall be cleaned of debris and flushed clean with water as necessary by the Contractor. Debris and flush water shall be contained at a lower manhole and removed from the line. Debris and flush water shall not be allowed to enter live existing sanitary sewers. Contractor shall be responsible for collection and proper disposal of debris and flush water.
4. All apparatus and equipment required for testing shall be furnished by the Contractor.
5. Contractor shall provide the Engineer and Owner with copies of all field notes and documentation obtained during final testing.

B. Scope:

1. All gravity sewers shall be tested by one or more of the following methods as directed by the City Engineer:
 - a. Direct Visual Inspection by the Engineer
 - b. Exfiltration of water
 - c. Infiltration of water
 - d. Exfiltration of air under pressure (Low Pressure Air Testing)
 - e. Video Inspection.
2. In addition to the above testing requirements, all PVC gravity sewers shall pass mandrel testing to verify roundness and proper installation.
3. All manholes shall be vacuum tested.

C. Direct Visual Inspection by the Engineer

1. The Engineer and/or his Representative shall visually inspect all gravity sewer pipe installed to verify alignment and ensure the pipe is free from obstructions and debris. Each segment of sewer shall be "flushed" using sunlight and mirrors. When the full diameter of the pipe is visible between adjacent manholes, the segment of pipe is deemed properly aligned and free of sags and debris.
2. If segment of pipe fails visual inspection, the pipe shall be cleaned and/or replaced and re-tested by the Contractor.

D. Exfiltration of Water

1. The section of sewer to be tested shall be sealed by inserting inflatable rubber bags or plugs in the pipes or by other means approved by the Engineer. Water shall then be introduced into a manhole until the pipeline section is completely filled. The Contractor shall fill the pipe to the required test level prior to the time of exfiltration testing to permit normal absorption into the pipe walls if concrete or concrete lined ductile iron pipe is being tested. Throughout the test period of two (2) hours minimum, the water level in the upper manhole shall be maintained at least 18-inches above the crown of the upper end of the pipe or at least 18-inches above the groundwater table, whichever is greater. The length of pipe tested shall be limited such that the pressure on the centerline of the lower pipe end tested does not exceed six (6) feet water column.

2. Exfiltration of water shall not exceed 100-gallons per mile of sewer per inch of inside diameter per 24-hours in any section of the completed work. In no case shall the exfiltration of water exceed 2500 gallons per mile per 24 hours. All observed leaks shall be corrected by the Contractor even though exfiltration is within the allowable limits.
3. The Engineer may direct the Contractor to test selected sections of the sewer in the following manner: after the selected sections of the sewer are laid in the trench and the joints completed but before any backfill is placed, the Contractor shall install suitable bulkheads or stoppers in each end of the sewer and fill the sewer with water. The sewer shall be filled through one length of sewer pipe installed vertically at a wye or at the end of the pipe being tested. Water shall be maintained in the line approximately to the top of the fill pipe until the Engineer can inspect the section of sewer being tested. Any leaks in the sewer system being tested shall be repaired by the Contractor. The total amount of sewer thus tested shall not exceed five percent (5%) of the total length of sewer constructed. Should the results of any of these tests indicate leakage, the Engineer may direct the Contractor to change the methods of construction to reduce the leakage on the remaining part of the work.

E. Infiltration of Water:

1. The section of sewer to be tested shall have been trench backfilled and the test conducted by inducing infiltration conditions by jetting the sewer trench for a sufficient length of time to ensure that the water level in the trench is a minimum of eighteen (18) inches over the crown of the sewer pipe. The test must be performed before existing sewers are connected and before sewage load is allowed in the sewers.
2. Infiltration of ground water or other leakage into the sewer (including manholes) shall not exceed 100 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours in any section of the completed work, and in no case shall it exceed 2500 gallons per mile per 24 hours.
3. Infiltration flow shall be measured in wet weather by a 90-degree "V-notch" weir with free discharge or other means acceptable to the Engineer. These weirs shall be furnished, installed, and removed by the Contractor.
4. Any leaks into the sewer that can be located shall be repaired or corrected by the Contractor as directed by the Engineer regardless of infiltration test results.

F. Exfiltration of Air Under Pressure (Low Pressure Air Testing):

1. Scope
 - a. This recommended practice defines the proper procedures for acceptance testing of installed gravity sewer pipe, using low-pressure air, to provide assurance that the pipe, as installed, is free from significant leaks. Included are requirements for equipment accuracy, safety precautions, line preparation, test method, and minimum holding times. This recommended practice does not cover the testing of manholes. All new pipe shall be low-pressure air tested to ensure the integrity of the pipe and joints
 - b. Only lines tested after backfilling to final grade will be considered for acceptability. However, this test may also be used by the installer as a presumptive test to determine the condition of the line prior to backfilling. At no time will more than four manhole to manhole reaches of pipe be installed before air testing is performed.
 - c. Low Pressure Air Testing shall be conducted in accordance with ASTM C828, C924, F1417 and UBPPA UNI-B-6.

2. Responsibilities:

- a. Responsibility of the Contractor: Unless otherwise specified, the Contractor shall furnish all the necessary equipment and be responsible for conducting all low-pressure air tests. In addition, the Contractor is responsible for any necessary repair work on sections that do not pass the test. No sealant shall be used in any newly installed sewer without the prior approval of the Engineer. Proper structural repair work will be required by the Engineer or the Owner.
- b. Responsibility of the Engineer: The Engineer and/or a qualified inspector shall witness all low-pressure air tests and verify the accuracy and acceptability of the equipment utilized. The engineer should inform the Contractor regarding acceptable methods of repair in the event one or more sections fail to pass the low-pressure air test. The Engineer should also report to the Owner regarding the acceptability of the Contractor's work.
- c. Responsibility of the Owner: The Owner shall make a final decision as to the acceptability of the Contractor's work based upon the Engineer's recommendation.
- d. Regulatory Agencies: Regulatory Agencies in the State, Federal, and/or local level may be legally entitled to witness any air testing and/or review the results. The Owner or his Engineer should check to see that the low-pressure air test specified for his installation is at least as stringent as those which may be required by such regulatory bodies.

3. Equipment

- a. Air testing shall be performed by the Contractor using equipment manufactured by Cherne Industries, Inc., or approved equal. Equipment used shall meet the following minimum requirements.
- b. Pneumatic plugs shall resist internal testing pressures without requiring external bracing or blocking. However, the Contractor should internally restrain or externally brace the plugs to the manhole wall as an added safety precaution throughout the test. No one shall be allowed in the manhole adjoining a line being tested so long as pressure is maintained in the line.
- c. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
- d. To facilitate test verification by inspecting Engineer, all air used shall pass through a single, aboveground control panel.
- e. The aboveground air control equipment shall include a shut-off valve, pressure regulating valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psi.
- f. Three individual hoses shall be used for the following connections:
 - 1. from control panel to pneumatic plugs for inflation.
 - 2. from control panel to sealed line for introducing the low-pressure air.
 - 3. from sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

4. Line Preparation

- a. During sewer construction, all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result.
- b. A wetted interior pipe surface is desirable and will produce more consistent test results. Where practical, clean the line with cleaning balls, manufactured by Cherne Industries Incorporated or equal, prior to testing, to wet the pipe surface

and eliminate debris.

5. Test Procedure

- a. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to the manufacturer’s recommended inflation pressure. The sealed pipe shall be pressurized to 9 PSIG. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
- b. After a manhole to manhole reach of the pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to manufacturer’s recommended inflation pressure. When plugs are being placed, the pipe adjacent to the manhole shall be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole.
- c. Low pressure air shall be slowly introduced into this sealed line until the internal air pressure reaches 4.0 PSIG greater than the average back pressure of any groundwater above the pipe, but not greater then 9.0 PSIG. If groundwater is present, refer to the following Paragraph 6. Determination of Groundwater Elevation and Air Pressure Adjustment , of Section 3.5.F in this Specification.
- d. After a constant pressure of 4.0 PSIG (greater than the average groundwater back pressure) is reached, the air supply shall be throttled to maintain the internal pressure for at least 2 minutes.
- e. When the pressure has stabilized at 4.0 PSIG, the air hose from the control panel to air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 PSIG. At a reading of 3.5 PSIG, or any convenient observed pressure reading between 3.5 PSIG and 4.0 PSIG, timing for the test may begin.
- f. The portion of line being tested shall be termed “Acceptable” if the allocated line pressure decreases less than one PSI in the time shown for the given diameters and lengths in the following table. Consult the City Engineer for test lengths greater than those provided.

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP

PIPE DIA (INCHES)	SPECIFICATION TIME FOR LENGTH SHOWN (MIN:SEC)							
	100 FT	150 FT	200 FT	250 FT	300 FT	350 FT	400 FT	450 FT
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

- g. If there has been no leakage (0 PSIG drop) after one hour of testing, the test section shall be accepted and the test complete. If there is any pressure drop, the complete test shall be run to determine whether or not the test section is acceptable.
- h. If the pressure drops 1.0 PSIG before the appropriate time shown in the table has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.

- i. If the section fails to meet these requirements, the Contractor shall determine the source(s) of leakage, and he shall repair or replace all defective materials and/or workmanship to the satisfaction of the Engineer. The extent and type of repair which may be allowed, as well as results, shall be subject to the approval of the Engineer. The completed pipe installation shall then be retested and required to meet the requirements of this test.

6. Determination of Groundwater Elevation and Air Pressure Adjustment

- a. In areas where ground water is known to exist, the Contractor shall install a ½-inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall directly on top of one of the sewer lines entering the manhole. A permanent, watertight seal shall be provided around the pipe nipple at the manhole wall. This shall be done at the time the sewer line is installed.
- b. Immediately prior to the performance of the air testing, the ground water shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The plastic tube shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.31 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig. This will increase the 3.5 psig (mentioned in item e above) to 8.5 psig, and the 2.5 psig to 7.5 psig.)
- c. The allowable pressure drop of 1.0 PSIG and the timing in the previous table are not affected and shall remain the same.
- d. In no case shall the starting test pressure exceed 9.0 PSIG. If the average vertical height of groundwater above the pipe invert is more than 12.7 feet, the section so submerged may be tested using 9.0 PSIG as the starting test pressure.
- e. After determining the air pressure adjustment, the test shall resume according to Item 5 - Test Procedures stated above.
- f. After determining groundwater height, each pipe nipple shall be recapped and sealed to prevent future infiltration.

G. Video Inspection:

1. Prior to final acceptance, the sewer installation shall be video inspected by the Contractor's forces. Said inspection shall verify locations of service connections, and locations of possible defects/infiltration. Any defects found shall be repaired by the Contractor in a manner acceptable to the Owner.

H. Mandrel Testing:

1. Mandrel test (deflection test) shall be performed by the Contractor in order to verify the roundness and proper installation of the PVC gravity sewer line.
2. Equipment systems used to perform mandrel tests shall be specifically designed for the pipe material being tested. Mandrels that do not specifically state the size and type of piping for which it is applicable shall not be allowed.
3. Deflection Test:
 - a. The deflection test shall consist of testing PVC gravity sewer pipe for proper installation by the method outlined (see ASTM D3034). The testing shall be accomplished prior to final acceptance, but at least 30 days after the pipe has

been backfilled completely to permit stabilization of the soil-pipe envelope.

- b. After the pipeline has been installed and backfill materials have been compacted to their required standard densities, the mandrel shall be pulled by hand through the pipeline with a suitable rope or cable that is connected to an eyebolt at one end of the gauge. A similar rope or cable shall be attached to the eyebolt at the opposite end of the mandrel and tension shall be applied to it. This will ensure that the mandrel maintains its correct position during testing and also to remove the mandrel if it should become lodged in an excessively deflected pipeline. Winching or other mechanical means of forcing the mandrel through the pipeline is unacceptable. Pipeline deflection testing shall have a deflection not exceeding 5% of the base inside pipe diameter as established by ASTM Standards D3034 and F679.
- c. Permanent record of all testing with locations where excessive pipeline deflections occur shall be kept by the Contractor and forwarded to the Engineer after completion of testing on each line.
- d. The Contractor shall immediately correct or replace all sections of pipe which deflect more than 5%.
- e. All material and labor required for testing and/or replacement of pipelines shall be furnished by the Contractor.
- f. Pipelines requiring correction and/or replacement shall be retested after an additional 30 day backfill stabilization period.

I. Manhole Vacuum Testing:

1. Vacuum tests shall be conducted on newly constructed manholes. Preliminary manhole testing shall take place following construction after all connections are made, and before backfilling. Test results derived from this test will allow time for necessary repairs to be completed before further construction proceeds and hinders such repairs. Final tests must be performed after the manhole has been backfilled.
2. Equipment:
 - a. Manhole vacuum tester assembly and vacuum pumps shall be manufactured by Cherne Industries, Inc., or approved equal.
 - b. Pneumatic plugs shall be manufactured by Cherne Industries, Inc. or approved equal. These plugs shall have a sealing length equal to or greater than the diameter of the connecting pipe to be sealed.
3. Procedures:
 - a. Plug all manhole entrances and exits other than the manhole top access using suitably sized pneumatic or mechanical pipeline plugs and follow all manufacturer's recommendations and warnings for proper and safe installation of such plugs. Plugs should be inserted a minimum of 6" beyond manhole wall. Make sure such plugs are properly rated for the pressures required for the test. The standard test of 10" Hg. (mercury) is equivalent to approximately 5 PSIG (0.3 bar) backpressure. Unless such plugs are mechanically restrained, it is recommended that the plugs are used with a minimum of two times (2x) safety factor or a minimum of 10 PSIG (0.7 bar) backpressure usage rating.

CAUTION: BRACE INVERTS IF LINES ENTERING THE MANHOLE HAVE NOT BEEN BACKFILLED TO PREVENT PIPE FROM BEING DISLODGED AND PULLED INTO THE MANHOLE.

- b. Any other openings such as lifting holes shall be sealed with an approved non-shrink grout.
- c. Install the vacuum tester head assembly at the top of the manhole. Adjust the cross brace to ensure that the inflatable sealing element inflates and seals against the straight top section of the manhole or the ring assembly, if possible. (If using a "plate" style manhole tester, position the plate on the manhole ring assembly).
- d. Attach the vacuum pump assembly to the proper connection on the testhead assembly. Make sure the vacuum inlet/outlet valve is in the closed position.
- e. Following safety precautions and manufacturer's instructions, inflate sealing element to the recommended maximum inflation pressure.
CAUTION: DO NOT OVER INFLATE.
- f. Start the vacuum pump and allow pre-set RPM to stabilize.
- g. Open the inlet/outlet ball valve and evacuate the manhole to 10" Hg. (approximately negative 5 PSIG, 0.3 bar).

CAUTION: DO NOT PRESSURIZE MANHOLE! THIS MAY RESULT IN MANHOLE DAMAGE AND/OR RESULT IN MANHOLE TEST HEAD DISLODGING FROM MANHOLE INLET!

- h. Close vacuum inlet/outlet ball valve and monitor vacuum for specified test period (see table). If vacuum does not drop in excess of 1" Hg., manhole is considered acceptable and the manhole passes the test. If manhole fails the test, Contractor shall complete necessary repairs and repeat test procedures until satisfactory results are obtained.

Minimum Test Times for Various Manhole Diameters

depth – feet	Manhole diameter – inches			
	48	60	72	96
8	20 sec	26 sec	33 sec	38
10	25 sec	33 sec	41 sec	48
12	30 sec	39 sec	49 sec	57
14	35 sec	46 sec	57 sec	67
16	40 sec	52 sec	67 sec	76
18	45 sec	59 sec	73 sec	86
20	50 sec	65 sec	81 sec	95
+ 2 ft incr.	+5 sec	+6.5 sec	+8.0 sec	+9.5 sec

(The values listed above are based upon ASTM Specification C1244 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test".)

- 4. Repeat the above test procedure after backfilling manhole for final acceptance test.
- 5. All manholes that fail the test or have visible leaks, even if they pass the test, shall be repaired or replaced by the Contractor until the manholes pass the test, to the complete satisfaction of the City Engineer. Manholes that have any visible leaks will not be accepted.

3.3 CLEAN-UP AND GRASSING:

- A. After the ditch lines have been sufficiently compacted, all excess material shall be removed from the job site by the Contractor.
- B. Any trees or undergrowth shall also be removed by the Contractor.

- C. All disturbed areas shall have topsoil replaced equal to that before construction began. If necessary, the Contractor shall provide topsoil.

END OF SECTION 02730

SECTION 02735 – HIGH DENSITY POLYETHYLENE PIPE & FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. High Density Polyethylene Pipe (HDPE) shall conform to and be tested under all of the requirements of ASTM Designation: F405 and F667 and AASHTO Designations: M252 and M294.

1.2 INSTALLATION

- A. All installation of HDPE pipe shall conform to ASTM D-2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications unless otherwise amended in these specifications.
- B. All HDPE pipe shall be installed on a crushed stone cushion placed the entire trench width.
- C. Where high water tables, flowing water or unstable soil conditions are encountered, crushed stone cushion shall be placed to the top of the pipe.
- D. The inside of all bells and outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.
- E. Pipe manufacture's guidelines for pipe installation should be adhered to.
- F. Trenching, backfill, and compaction shall conform to Section 312250 of these Specifications.

END OF SECTION 02735

SECTION 02810 - SODDING AND TOPSOIL

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 work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Sod:
 - 1. Provide strongly rooted **419 Bermuda Sod**
 - 2. Sod shall be not less than 2 years old and free of weeds and undesirable native grasses.
 - 3. Only provide sod capable of growth and development when planted (viable, not dormant).
 - 4. Provide machine cut sod of a uniform minimum soil thickness of 5/8 inch, plus thickness of top growth and thatch. Sod pieces to be consistent in size and shape.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Sodding shall be restricted to those as instructed or recommended by the local Cooperative Extension Agent except when special instructions to the contrary are issued in writing by the Architect.
 - 1. The Contractor shall furnish, in writing to the Architect, those recommendations of the Extension Agent before proceeding with any operations.
 - 2. Grassing also shall comply with State of Alabama Highway Department specifications, latest Edition.
 - 3. Contractor shall water and maintain newly grassed areas until acceptable stand of grass is established and approved by the Architect.
- B. Preparation of Subgrade Soil:
 - 1. The subgrade soil in those areas to be sodded whether shown or not shown on the plans shall be loosened to a minimum depth of 3 inches and graded to remove all ridges and depressions so that it will be, after settlement everywhere parallel to and at the proper level to provide finished grades specified.
 - 2. All stones over 1" in dimension, sticks, rubbish and other extraneous matter shall be removed during this operation.
- C. Topsoil:
 - 1. Contractor shall furnish and spread layer of topsoil over all areas.

Topsoil shall be spread in loose layers to provide finished grades specified and shall have an equal depth of not less than 4" over the site after natural settlement and light rolling.
- D. All areas shall be carefully graded and raked to accurate specified grades and uniform slopes following topsoil spreading. The surface, when finished and settled shall conform to required grades and shall be free from hollows and other inequalities, from stones over 1" in diameter, sticks and other debris, and shall be satisfactory to the Architect.
- E. Initial fertilization of sodded area prior to sodding and following preparation, commercial fertilizer 4-10-10 or 4-12-12 shall be applied on all grass areas at the uniform rate of 20 pounds per 1,000 square feet each.

3.2 SODDING

- A. Prepare all areas to receive sod.
- B. **The Contractor shall fully sod all graded and disturbed areas, including the Contractors staging area and all areas disturbed by vehicular construction traffic, whether shown on plans or not.**

3.3 TOPSOIL

- A. General:
 - 1. Provide topsoil of natural, friable, fertile, fine loamy, soil possessing the characteristics of representative top soils in the vicinity which produces a heavy growth; free from subsoil, weeds, litter, clods, stiff clay, stones, stumps, roots, trash, toxic substances or any other material which may be harmful to plant growth or hinder planting operations.
 - 2. The topsoil shall not be in a muddy or frozen condition. Topsoil shall be that material stripped and stockpiled, or as required to provide 4" of coverage.
 - 3. The topsoil shall have a pH range of 5.9 to 7.0.
 - 4. Limestone or aluminum sulfate (or acceptable substitute) may be used to adjust the pH of the topsoil to an acceptable level.

END OF SECTION

SECTION 02830 - TEMPORARY CHAIN LINK FENCING & GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Erection and maintenance of temporary chain link fencing and gates.
- B. Refer to Drawings for temporary fence type, layout, and location of gates.

1.2 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.

1.3 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Product Data: Include construction details, material descriptions, dimensions of individual components, and finishes for chain link fences and gates.
 - i. Fence, gate posts, rails, and fittings.
 - ii. Chain link fabric.
 - iii. Gates and hardware.
 - 2. Test Reports: Field test result for compliance of installation of chain link fence and gates.
- B. Informational Submittals:
 - 1. Manufacturer's recommended installation instructions.
 - 2. Evidence of Supplier and installer qualifications.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

1.5 SCHEDULING AND SEQUENCING

- A. Install temporary fence and gates as indicated on drawings prior to beginning demolition work and/or new construction work
- B. Complete necessary Site preparation and grading before installing chain link fence and gates.

PART 2 - PRODUCTS

2.1 MANUFACTURERE - Galvanized Steel Fencing: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

- A. Master Halco
- B. Merchants Metal
- C. Eagle Fences
- D. Equal products of other manufacturers may be used in the work provided, such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 TEMPORARY CHAIN LINK FENCING

- A. Unless otherwise indicated, type of temporary chain link fencing shall be as follows:
 - 1. New materials or previously used salvaged chain link fencing in good condition.
 - 2. Height: 8'-0" (minimum) unless otherwise indicated on drawings.

3. Posts: 2" min. galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings.
 4. Fencing Fabric: 2" diamond woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
 5. Privacy Fabric: Temporary fencing shall be outfitted with privacy fabric.
 - a. Color: Green
 - b. Material Requirement: Polyethylene, 4.9 oz/sq. yd., Burst Strength: 210 psi
- B. Gates: Provide personnel and vehicle gates of the quantity and size indicated on the Drawings or required for functional access to site.
1. Fabricate of same material as used for fencing.
 2. Vehicle gates:
 - a. Minimum width: 20 feet to allow access for emergency vehicles.
 - b. Capable of manual operation by one person.

PART 3 - EXECUTION

3.1 GENERAL- TEMPORARY CHAIN LINK FENCING

- A. Installation of temporary fencing shall not deter or hinder access to existing and new hose connections and fire hydrants.
 1. Maintain 3 feet diameter clear space around fire hydrants.
 2. Where fire hydrant or hose connection is blocked by fencing, provide access gate.
- B. Access: Provide gates for personnel, delivery of materials, and access by emergency vehicles.
- C. Field verify gate locations with Architect.

3.2 INSTALLATION - FENCE

- A. Chain link posts:
 1. Post spacing shall be 12' maximum if using prefabricated panels and 10' maximum if wire tying mesh to posts.
 2. End, Corner and Line posts shall be **set in concrete OR post driven.**
 3. Gate posts: Use concrete footings and brace to provide rigidity for accommodating size of gate. **Gate posts MUST be set in concrete.**
- B. Fabric: Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- C. Gates: Install with required hardware.
- D. Wire Ties: 11 gage galvanized steel.
- E. Tension Wire: 7 gage, galvanized coated coil spring wire, metal and finish to match fabric.
- F. Concrete: Provide concrete consisting of portland cement, ASTM C 150, aggregates ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28 day compressive strength of 3,000 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump.

3.3 INSTALLATION - GATES

- A. Chain link gates:
 1. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical

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members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8' apart unless otherwise indicated.

2. Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.
 3. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
- B. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASMT A 153, and in accordance with the following.
1. Hinges: Size and material to suit gate size, non-lift off type, offset to permit 180 degree gate opening. Provide 1½ pair hinges for each leaf over 6' nominal height.
 2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
 3. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.
 4. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.

3.4 MAINTENANCE

- A. Maintain fencing in good condition. If damaged, Contractor shall immediately repair at no additional cost to owner.

3.5 FIELD QUALITY CONTROL

- A. Post and Fabric Testing: Test fabric tension and line post rigidity according to ASTM F1916.
- B. Gate Tests:
1. Prior to acceptance of installed gates, demonstrate proper operation of gates under each possible open and close condition specified.
 2. Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.
 3. Confirm that latches and locks engage accurately and securely without forcing and binding.

3.6 CLEANUP

- A. Remove excess fencing materials, soil, concrete and any other debris from Site which resulted from installation of fences and/or gates.

END OF SECTION

SECTION 02831 - VINYL COATED CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. Extent of chain link fences and gates is indicated on drawings.

1.3 SECTION INCLUDES

- A. Fence framework, fabric, and accessories.
- B. Excavation for post bases; concrete foundation for posts gate assemblies.
- C. Manual swing gates and related hardware.

1.4 REFERENCES

- A. ANSI/ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
- C. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A569 - Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
- E. ASTM C94 - Ready-mixed Concrete.

1.5 SYTEM DESCRIPTION

- A. **Fence Height:** As indicated on drawings, otherwise 4 feet.
- B. **Fence Length:** As indicated on drawings.
- C. **Location:** As indicated on drawings.
- D. Intervals not exceeding 10 feet on center in straight runs and 8 feet on center curves.

1.6 SUBMITTALS

- A. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
- B. Qualifications:
- C. Manufacturer: Company specializing in manufacturing the products specified in this Section to have minimum three years documented experience.

1.7 FIELD MEASUREMENTS

- A. Verify that field measurements are as shown on Drawings prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

- A. Fence System:
 - 1. Master-Halco, Inc
 - 2. Merchants Metals
 - 3. Stephens Pipe and Steel, LLC.
 - 4. Equal products of other manufacturers may be used in the work provided, such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

- B. Fence Framework:
 1. Allied Tube: Product SS 40.
 2. Century Tube: Product CMT 40.
- C. Chain Link Fabric:
 1. Merchants Metals.
 2. Cargill.
- D. Padlocks:
 1. Yale.
 2. Master.
 3. Sargent.

2.2 MATERIALS & COMPONENTS

- A. Framing Materials: Round SS 40, steel pipe, vinyl coated per ASTM F1234 outside. Post to have tops to exclude moisture.
- B. Fabric: 9 gage fused bonded fabric shall have PVC coating of 7 to 12 mils per ASTM F668 Class 2B.
- C. Swing Gates: Size as shown on Drawings covered with chain link fabric. Gates shall be complete with industrial type, fixed pin, 180 degree hinges and drop latches with padlock left in proper operating condition.
- D. Padlocks: Industrial grade and shall be keyed alike, and as Owner's existing locks, when more than one is required.
- E. Components:
 1. Line Posts: 2.0 inch outside diameter.
 2. Corner and Terminal Posts: 3.0 inch outside diameter.
 3. Swing Gate Posts: 3.0 inch minimum outside diameter for less than 6 foot gate leaf. 4.0 inch minimum outside diameter for 6 foot gate leaf or greater or outside diameter as required by design. Posts shall be of sufficient diameter and weight to prevent deflection or gate sagging.
 4. Top and Bottom Rail: 1-5/8 inch diameter, plain end, sleeve coupled with 0.111 inch wall thickness. Provide Mid-Rails at fences and gates in excess of 5 feet in height.
 5. Swing Gate Frame: 1-5/8 inch minimum diameter welded or fitting type fabrication. Welded fabrication shall be vinyl coated after weld connections are made. The frame components shall be of sufficient diameter, weight and design to avoid sagging and allow easy operation.
 6. Fabric: 2 inch vinyl coated diamond mesh interwoven wire, 9 gage thick, top selvage twisted tight, bottom selvage knuckle end closed.
 7. Tension Wire: 7 gage thick steel, single strand, vinyl coated.
 8. Tie Wire: Aluminum alloy steel wire, vinyl coated.
- F. Accessories:
 1. Caps: Cast steel vinyl coated; sized to post diameter, set screw retainer.
 2. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel, vinyl coated.
 3. Swing Gate Hardware: Fork latch with gravity drop, center gate stop and drop rod; three 180 degree gate hinges per leaf and hardware for padlock.
- G. Finishes:
 1. Components: Vinyl coated to ASTM F123, 10-14 mil coating.

2. Hardware: Vinyl coated.
3. Accessories: Same finish as fabric.
4. Color: Shall be selected by Architect and Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ANSI/ASTM F567 and manufacturer's instructions.
- B. Set all posts plumb, in concrete footings with top of footing 1 inch above finish grade. Slope top of concrete for water runoff.
- C. Line Post Footing Depth Below Finish Grade: Minimum three feet (18 inches in solid rock) and not less than 12 inches in diameter.
- D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: Minimum three feet (18 inches in solid rock) and not less than 12 inches in diameter.
- E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.
- F. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
- G. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- H. Position bottom of fabric 2 inches above finished grade.
- I. Fasten fabric to top, bottom and mid- rails, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips. Install bottom tension wire stretched taut between terminal posts.
- K. Do not swing gate from building wall; provide gate posts.
- L. Install gates with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt, foot bolts and sockets, torsion spring, retainer and locking clamp.
- M. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- N. Clean all excess grout, concrete, grease, paint, etc., from fence.
- O. Erection Tolerances:
 1. Maximum Variation From Plumb: 1/4 inch.
 2. Maximum Offset From True Position: 1 inch.
 3. Components shall not infringe adjacent property lines.

3.2 SCHEDULE

- A. Fence and gate location(s) as indicated on Drawings.
- B. Fence and gate size(s) as indicated in this section, otherwise as indicated on drawings.

END OF SECTION

SECTION 02846 - SITE GRAPHICS

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 work of this section.

1.2 SECTION INCLUDES

- A. Provide traffic control signs complying with U. S. Department of Transportation, Federal Highway Administration's "Manual on Uniform Traffic Control Devices" and as required by other local ordinances or regulations or other governing authorities and as specified herein. See Drawings for type and quantity of signs required.
- B. Work shall comply with the latest edition of city ordinance and/or regulations and requirements of any governing authority on site graphics.

1.3 SUBMITTALS

- A. Submit manufacturer's mounting instructions to Owner, Architect and Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

- A. SA-SO, Inc.; www.sa-so.com; 525 N. Great Southwest Pkwy., Arlington, Texas 76011; Phone: 972.641.4911.
- B. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

A. SIGNS

- 1. "Handicapped Parking" with Symbol Sign
 - a. 12"x18"
 - b. Blue legend on White reflective background
 - c. ASTM Type II Super Engineer Grade (SEG) sheeting on reflective sign
- 2. "Van Accessible" Supplemental Sign
 - a. 12"x6"
 - b. Blue legend on White reflective background
 - c. ASTM Type II Super Engineer Grade (SEG) sheeting on reflective sign

B. POSTS

- 1. "U" Channel Sign Posts
 - a. Standard Weight: 2 lbs. per foot
 - b. Galvanized
 - c. Pre-drilled and punched on 1" centers entire length for easy sign mounting.
 - d. Meet ASTM A499

2.3 MOUNTING HARDWARE

- A. Provide stainless steel nuts, bolts, and washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Placement of all site signage shall be as directed by the Architect during construction.
- B. Mount signs in accordance with manufacturer's instructions.

END OF SECTION

SECTION 03310 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of concrete work is shown on drawings.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
 - 1. ACL 301 "Specifications for Structural Concrete for Buildings".
 - 2. ACI 318 "Building Code Requirements for Reinforced Concrete"
 - 3. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
- B. Concrete Testing Service: The **Owner** will engage and pay a testing laboratory to perform material evaluation tests.
- C. Materials and installed work may require retesting, as directed by Architect, at anytime during progress of work. Provide free access to material stockpiles and facilities. Retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.4 SUBMITTALS

- A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joints systems, curing compounds, dry-shake finish materials and others as requested by Architect.
- B. Shop Drawings Reinforcements: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement.
- C. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Use plywood complying with U. S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- C. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.
- D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

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2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed, unless otherwise noted.
- B. Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed to view concrete surfaces, where legs of supports are in contact with forms, provide support with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 3).

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type 1, unless otherwise acceptable to Architect.
 - 1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- B. Normal Weight Aggregate: ASTM C 33, and as herein specified. Provide aggregate from a single source for all concrete.
 - 1. Do not use fine or coarse aggregates containing spalling-causing deleterious substances.
- C. Water: Drinkable.
- D. Air-Entraining Admixture: ASTM C 260.
 - 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Air-Mix, Euclid Chemical Co.
 - b. Sika-Ai", Sika Corp.
 - c. Darex AEA, W. R. Grace
 - d. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- E. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1% chloride ions.
 - 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Accelguard 80; Euclid Chemical Company
 - b. Pozzoloth High Gally; Master Builders
 - c. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- F. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.1% chloride ions.
 - 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Edoco 20006; Edoco Technical Products
 - b. Pozzoloth 300-R; Master Builders

- c. Eucon Retarder 75; Euclid Chemical Company
 - d. Daratard; W. R. Grace
 - e. Plastiment; Sika Chemical Company
 - f. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- G. Certification: Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.
- H. Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.

2.4 RELATED MATERIALS

- A. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E 154, as follows:
- 1. Polyethylene sheet not less than 10 mils thick.
- B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
- 1. Waterproof paper
 - 2. Polyethylene film.
 - 3. Polyethylene-coated burlap.
- D. Liquid Membrane Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type 1-D, Class A unless other type acceptable to Architect. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal. Equal to "Kure-N-Seal" - 30; Sonneborn-Contech
- 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Master Builders
 - b. Euclid Chemical Company
 - c. A.C. Horn
 - d. The Burke Company
 - e. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- E. Bonding Compound: Polyvinyl acetate or acrylic base, re-wettable type.
- 1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Welcrete; Larsen Products
 - b. EucoWeld; Euclid Chemical Company
 - c. Hornweld; A. C. Horn
 - d. Sonocrete; Sonneborn-Contech
 - e. Acrylic Bondcrete; The Burke Company
 - f. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

- F. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.
1. MANUFACTURERS: The following manufacturers' products have been used establish minimum standards for materials, workmanship and function:
 - a. Epoxitite; A. C. Horn
 - b. Sikadur Hi-Mod; Sika Chemical Corporation
 - c. Euco Epoxy 463 or 615; Euclid Chemical Company
 - d. Patch and Bond Epoxy; The Burke Company
 - e. Sure-Poxy; Kaufman Products, Inc.
 - f. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- G. Subfloor Patching and Leveling: The following manufacturers' products have been used establish minimum standards for materials, workmanship and function:
1. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. Ardex K-15; Ardex Engineered Cements 400 Ardex Park Drive Aliquippa, PA 15001; (724) 203-5000
 - b. Equal products of other manufacturers may be used in the work, provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

PART 3 - EXECUTION

3.1 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.
- C. Design mixes to provide normal weight concrete as indicated on drawings and schedules.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
- E. Admixtures:
 1. Use water-reducing admixture in all concrete for ease of placement and workability.
 2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
 3. Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 6% with a tolerance of plus-or-minus 1-1/2%.
- F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
 1. Ramps, slabs and sloping surfaces: 3" to 5".

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2. Reinforced foundation systems: 2" to 5".
3. Other concrete: 3" to 5".

3.2 CONCRETE MIXES

- A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
 2. When air temperature is between 85 degrees F and 90 degrees, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

3.3 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines and dimensions shown and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, off-sets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set time to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Form Ties: Factory-fabricated, adjustable-length, removable, or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
 1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.4 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

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- C. Accurately position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.5 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated, or if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.
 - 1. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.
- B. Isolation Joints in Slabs-On-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, and elsewhere as indicated.
 - 1. Joint filler and sealant materials are specified in Division-7 sections of these specifications.
- C. Construction Joints in Slabs-On-Ground: Construct construction joints in slabs-on-ground to form panels of patterns no larger than 600 square feet and as shown and as detailed. An alternative control joint detail may be inserts 1/8" to 1/4" wide x 1/4 of slab depth.
 - 1. Form contraction joints by inserting premolded plastic, hardboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris, fill groove with joint sealant.
 - 2. Joint sealant material is specified in Division-7 sections of these specifications.

3.6 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.
 - 1. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.7 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.8 CONCRETE PLACEMENT

- A. Replacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately

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before placing concrete where form coatings are not used.

1. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- B. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete", and as herein specified.
1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Bring slab surfaces to correct level with straightedge and strike-off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position during concrete placement operations.
- E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40 degrees F uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F. and not more than 80 degrees F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not place concrete when air temperature has fallen to or is expected to fall below 35 ° F. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- F. Hot Weather Placing:
1. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACE 305 and as herein specified.
 2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
4. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
5. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.9 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete such as waterproofing, dampproofing. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: For formed concrete surfaces exposed to view provide smooth rubbed finish, not later than one day after form removal.
 1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 MONOLITHIC SLAB FINISHES

- A. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for randomly trafficked floor surfaces:
 1. Specified overall values of flatness, F(F) 38: and levelness, F(L) 25: with minimum local values of flatness, F(F) 19: levelness, F(L) 13: for slabs on grade.
- B. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo and other bonded applied cementitious finish flooring material, and as otherwise indicated.
- C. Slope surface uniformly to drains where required. After leveling, roughen surfaces before final set, with stiff brushes, brooms or rakes.
- D. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing membrane or elastic roofing, or sand-bend terrazzo, and as otherwise indicated.
 1. After screeding consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- E. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Grind smooth surface defects which would telegraph through applied floor covering system.
- F. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.
1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than 7 days.
 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
1. Provide moisture curing by one of the following methods or by a combination of the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
- C. Provide moisture-cover curing as follows:
1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- D. Provide curing and sealing compound to interior slabs with resilient flooring, carpet over cushion, or left exposed; and to exterior slabs, walks, and curbs as follows:
1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within two hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
- E. Do not use membrane curing compounds on surface which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, damp-proofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to Architect.
- F. Curing Formed Surfaces: Cure formed concrete surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

- H. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.
- I. Sealer and Dust-proofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.12 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of walls, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided cutting and protection operations are maintained.
- B. Formwork supporting weight of concrete, may not be removed in less than fourteen (14) days and until concrete has attained design minimum compressive strength of in place concrete by testing field-cured specimens representative of concrete location in members.
- C. Form facing material may be removed four (4) days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.13 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.14 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- D. Reinforced Masonry: Provide concrete grout for reinforced masonry, masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms when acceptable to Architect.
 - 1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
 - 2. For exposed to view surfaces, blend white portland cement and standard portland cement so that when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
 - 1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
 - 1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets and other objectionable conditions.
 - 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
 - 3. Correct low areas in unformed surfaces during, or immediately after, completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
 - 4. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and exposed reinforcing steel with at least 3/4" clearance all around.
 - 5. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 6. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than seventy-two (72) hours.
 - 7. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
 - 8. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Owner will employ and pay for a testing laboratory to perform tests and to submit test reports. The Contractor shall notify testing agency 24 hours in advance of requirements.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.
- C. The Owner shall maintain equipment on site to cast cylinders, perform slump and air tests, and field cure specimens. Should the project testing agency be absent from the site, the Contractor will be responsible for performing the field tests below.
- D. Sampling Fresh Concrete: ASTM C 172, except as modified for slump to comply with ASTM C 94.

1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 2. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degrees F. and above; and each time a set of compression test specimens made.
 3. Compression Test Specimen: ASTM C 31; one set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
- E. Compressive Strength Tests: ASTM C 39; one set for each day's pour plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at seven (7) days, two specimen tested at twenty-eight (28) days, and one specimen retained in reserve for later testing if required. Minimum compressive strength of concrete shall be 3,000 psi at 28 days unless otherwise indicated.
1. When frequency of testing will provide less than five (5) strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
 2. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived by Architect if, in his judgment, adequate evidence of satisfactory strength is provided.
 3. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 4. Test results shall be reported in writing to Architect and Contractor within twenty-four (24) hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at twenty-eight (28) days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other non- destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- G. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
1. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 04200 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of each type of masonry work is indicated on drawings and schedule.
- B. Types of masonry work required include.
 - 1. Concrete unit masonry.
 - 2. Brick masonry.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.
- B. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- C. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- D. Samples: Submit the following samples:
 - 1. Unit masonry samples for each type of exposed masonry unit required; include in each set the full range of exposed color and texture to be expected in completed work.
 - 2. Include size variation data verifying that actual range of sizes for brick falls within ASTM C652 dimension tolerances for brick where modular dimensioning is indicated. The grade shall be SW and the type HBS.
- E. Field Constructed Mock-Up Panel: Prepare mock-up panel for the following types of masonry. Purpose of mock-up is further verification of selections made for color and finish under sample submittals and establishing standard of quality for aesthetic effects expected in completed work. Build mock-up panel to comply with the following requirements:
 - 1. Locate mock-up panel on site where directed by the Architect.
 - 2. Build mock-up panel of typical exterior masonry wall, approximately 4'-0" long by 4'-0" high, showing all typical components, connections, attachments to building structure and methods of installation.
 - 3. Retain mock-up panel during construction as standard for judging completed masonry work. When directed, demolish mock-up panel and remove from site.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes. Store masonry units off the ground.
- C. Store cementitious materials off the ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained.

- E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.5 PROJECT CONDITIONS

- A. Protection of Work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.
- B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- C. Do not apply uniform floor or roof loading for at least 24 hours after building masonry walls or columns.
- D. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- E. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- F. Protect sills, ledges and projections from droppings of mortar.
- G. Environmental Protection:
 - 1. Maintain air temperature and materials to a minimum of 40 degrees F and a maximum of 90 degrees F prior to and during masonry work
 - 2. Do not lay masonry units which are wet or frozen.
 - 3. Remove masonry damaged by freezing conditions.
- H. For clay masonry units with initial rates of absorption (suction) which require them to be wetted before laying, comply with the following requirements.
 - 1. For units with surface temperatures above 32°F wet with water heated to above 70°F.
 - 2. For units with surface temperatures below 32°F wet with water heated to above 130°F.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
 - 1. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - 2. Provide bullnose units for outside corners, except where indicated as square-edged.
- B. Concrete Block: Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and under each form of block included, for weight classification.
 - 1. Grade N
 - 2. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high x thickness indicated.
 - 3. Type I: moisture-controlled units.
 - 4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - 5. Hollow Loadbearing Block: ASTM C 90 and as follows:
 - a. Weight Classification: Lightweight
 - 6. All CMU sills shall be bullnose concrete block, unless another material is indicated on the drawings. If the sills are indicated to receive another material (ie: Solid Surface fabrication, wood, etc.) placed on top of the CMU sill, the CMU sill shall be straight edged concrete block units.

2.2 BRICK MADE FROM CLAY OR SHALE

- A. MANUFACTURERES: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. ACME Brick Company, Montgomery, AL
 - 2. Boral Bricks, Phenix City, Al
 - 3. Henry Brick Company, Selma, AL
 - 4. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- B. General: Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
- C. Provide special molded shapes where indicated and for application requiring brick of form, size and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.
- D. For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured or unfroged units with all exposed surfaces finished.
- E. Facing Brick: Submit samples for approval of equals prior to bids. Eased edge brick shall not be allowed.
- F. BRICK ALLOWANCES
 - 1. *Face Brick* shall have a valve of **\$600.00 dollars per thousand** (Allowances shall be for material only, based on actual number of bricks purchased for the project. Installation, profit, overhead, shipping and taxes shall be included in the Contractors Bid Proposal). If Architect chooses brick of lesser value after Bid Process, Contractor shall issue a deductive Change Order for the difference.
 - 2. *Accent Brick* shall have a valve of **\$600.00 dollars per thousand** (Allowances shall be for material only, based on actual number of bricks purchased for the project. Installation, profit, overhead, shipping and taxes shall be included in the Contractors Bid Proposal). If Architect chooses brick of lesser value after Bid Process, Contractor shall issue a deductive Change Order for the difference.

2.3 MORTAR AND GROUT MATERIALS

- A. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Atlas
 - 2. Citadel
 - 3. Lone Star
 - 4. Magnolia
 - 5. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- B. Masonry Cement: ASTM C 91.
 - 1. Type S for CMU walls
 - 2. Type N for Exterior Face and Accent brick – color pigment.
- C. ALLOWANCES:
 - 1. *Face and Accent Brick* to have a valve of **\$26.00 dollars per bag**. (Allowances shall be for material only, based on actual number of bags purchased for the project. Installation, profit, overhead, shipping and taxes shall be included in the Contractors Bid Proposal). If Architect chooses mortar of lesser value after Bid Process, Contractor shall issue a deductive Change Order for the difference.

- D. Hydrated Lime: ASTM C 207, Type S.
- E. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.
- F. Water: Clean and potable.

2.4 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Dur-O-Wall, Inc.
 - 2. Heckman Building Products, Inc.
 - 3. Masonry Reinforcing Corp. of America.
 - 4. National Wire Products Corp.
 - 5. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- B. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics.
- C. Use individual galvanized steel metal ties installed in horizontal joints to bond wythes together **only** where wood or metal stud backup occurs. Provide ties as shown, but not less than one metal tie for 4 sq. ft. of wall area spaced not to exceed 24" o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 1'-0" of all openings and space not more than 3'-0" apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24" o.c. vertically.
- D. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 123, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
- E. Application: Use where indicated.
- F. Joint Reinforcement: Provide truss-type, welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
 - 1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" else- where.

2.5 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet.
 - 2. Provide splice plates at joints of formed, smooth metal flashing.
 - 3. Fabricate through-wall metal flashing embedded in masonry from, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - 4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 - 5. Fabricate through-wall flashing with drip edge where indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.
 - 6. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.

7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
 8. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.
 9. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
 10. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:
 - a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
 - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive.
 - c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
 - d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 2. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- D. MANUFACTURERS: The following manufacturers' products have been used to establish minimum standards for materials, workmanship, and function:
1. Vinyl Sheet Flashing: (Thickness: 20 mils)
 - a. Vi-Seal Plastic Flashing; Afco Products, Inc.
 - b. BFG Vinyl Water Barrier; B.F. Goodrich Co.
 - c. Nuflex; Sandell Manufacturing Co., Inc.
 - d. Wascosea"; York Manufacturing, Inc.
 - e. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.6 MISCELLANEOUS MASONRY ACCESSORIES

- A. See drawings for locations of all required control joints.
- B. Non-Metallic Expansion Joint Strips: Pre-molded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35%, of width and thickness indicated.
- C. Premolded Control Joint Strips: Material as indicated below designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
1. Polyvinyl chloride complying with ASTM D 2287, General Purpose Grade, Designation PVC-63506.

- D. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.7 MASONRY CLEANERS

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

2.8 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
- B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.
 - 1. For Exterior Brick, use Type N mortar, equal to Flamingo, Blue Circle or Lehigh.
 - 2. For Other Masonry Units use Type S mortar without coloring pigment.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure each clay masonry unit being nearly saturated but surface dry when laid.
- B. Do not wet concrete masonry units.
- C. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.
- D. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.
- E. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
- G. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
 - 1. Use wet cutting saws to cut concrete masonry units.

3.2 LAYING MASONRY WALLS

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Coursing and Bonding:
 - 1. **All CMU shall be Running Bond.**
- C. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

- D. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
 - 1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

- A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- C. Maintain joint width shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
- D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
- E. Tool all exposed joints, except where otherwise indicated, slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.4 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

- A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
 - 1. For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as shown below:
 - 1. At juncture of interior partitions and exterior walls, rake and caulk vertical joint.
 - 2. Provide metal ties as shown below.
 - 3. Provide individual metal ties at not more than 16" o.c. vertically.
 - 4. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
- D. Intersecting Load-bearing Walls: If carried up separately, block or tooth vertical joint with 8" maximum offsets and provide rigid steel anchors spaced not more than 4'-0" o.c. vertically, or omit blocking and provide rigid steel anchors at not more than 2'-0" o.c. vertically. Form anchors of galvanized steel not less than 1-1/2" x 1/4" x 2'-0" long with ends turned up not less than 2" or with cross-pins. If used with hollow masonry units, embed ends in mortar-filled cores.
- E. Non-bearing Interior Partitions: Build full height of story to underside of roof structure above, unless otherwise shown.

3.5 CAVITY WALLS

- A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.

- B. Tie exterior wythe to new back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16" o.c. vertically.
- C. Provide weep holes (Open Head Joints) in exterior wythe of cavity wall located as directed on the drawings, spaced 32" o.c., unless otherwise indicated.

3.6 CAVITY WALL INSULATION

- A. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill all cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 HORIZONTAL JOINT REINFORCEMENT

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
- D. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.
 - 1. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide formed-in-place masonry lintels. Temporarily support formed-in-place lintels.
- C. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.10 FLASHING OF MASONRY WORK

- A. General: Provide concealed flashing in masonry work at, or above shelf angles, lintels, ledges and other obstructions to the down-ward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.
- B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.
- C. Interlock end joints of deformed metal flashings by over-lapping deformations not less than 1-1/2" and seal lap with elastic sealant.
- D. Install flashing to comply with manufacturer's instructions.

- E. Provide weep holes (open head joints) in the head joints of the first course of masonry immediately above concealed flashings. Space weep holes 32" o.c., unless otherwise indicated.

3.11 REPAIR, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point- up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
 - 4. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clean water.
 - 5. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 10 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - a. Detergent
 - 6. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

END OF SECTION

SECTION 05120 - STRUCTURAL STEEL

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated.
 - 1. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
 - 2. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
 - 3. AWS D1.1 "Structural Welding Code".
 - 4. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
- C. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 - 1. If re-certification of welders is required, retesting will be Contractor's responsibility.

1.4 SUBMITTALS

- A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel including certified copies of mill reports covering chemical and physical properties.
 - 2. High-strength bolts including nuts and washers.
 - 3. Structural steel primer paint.
 - 4. Shrinkage-resistant grout.
- B. Shop Drawings: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members procedures and diagrams. All shop and erection drawings shall be prepared under the direct supervision of a registered engineer and shall be sealed by said engineer.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
 - 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Miscellaneous Steel Shapes, Plates, Channels, Bars and other shapes: ASTM A 36.
- C. Wide Flange and CWT Shapes: ASTM A992 Grade B, $F_y=50$ ksi
- D. Cold-Formed Steel Tubing: ASTM A 500, Grade B, $F_y=46.0$ ksi
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 - 1. Finish: Black, except where indicated to be galvanized.
- F. Anchor Bolts: ASTM A 307, nonheaded type unless otherwise indicated.
 - 1. Provide hexagonal heads and nuts for all connections.
- G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
- H. Electrodes for Welding: Comply with AWS Code.
 - 1. For high-strength low-alloy steel, provide electrodes, welding rods and filler metals equal in strength and compatible in appearance with parent metal joined.
- I. Structural Steel Primer Paint: Manufacturer's standard (no lead).
- J. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C62I.
 - 1. The following manufacturers' products have been used to establish minimum standards for material, workmanship and function:
 - a. Dayton Superior 1107 Advantage
 - b. Euco N.S.; Euclid Chemical Co.
 - c. Crystex; L&M Construction Chemicals
 - d. Masterflow 713; Master Builders
 - e. Five Star Grout; U.S. Grout Corp.
 - f. Upcon; Upco Chem. Div., USM Corp.
 - g. Propak; Protex Industries, Inc.
 - h. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2. Manufacturer Single Source: Provide cementitious grout products from a single qualified manufacturer.
3. Cementitious Grout: Cementitious grout for high performance applications.
4. Product shall conform to:
 - a. CRD C621, US Army Corps of Engineers Specification for Non-Shrink Grout
 - b. ASTM C1107, Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (non-shrink)
5. Basis of Design Product:

“EUCO TREMIE GROUT” by The Euclid Chemical Company

 - a. Compressive Strength, ASTM C109 Modified to ASTM C1107 Section 11.5, 2 in. (5 cm) cubes:
 - i. At 72° F (22° C)
 - a) 1 day: 3200 psi (22MPa)
 - b) 3 days: 4800 psi (33 MPa)
 - c) 7 days: 5600 psi (38 MPa)
 - d) 28 days: 7200 psi (49 MPa)
 - ii. At 50° F (10° C)
 - a) 1 day: 1000 psi (7 MPa)
 - b) 3 days: 3000 psi (20 MPa)
 - c) 7 days: 3700 psi (25 MPa)
 - d) 28 days: 4500 psi (31 MPa)
 - b. Volume Change, ASTM C1090 and CRD C621:
 - i. At 72° F (22° C)
 - a) 3 days: 0.04%
 - b) 7 days: 0.06%
 - c) 14 days: 0.06%
 - d) 28 days: 0.08%
 - c. Setting time, ASTM C191:
 - i. At 72° F (22° C)
 - a) Initial set: 5 hours
 - b) Final set: 7 hours
 - ii. At 50° F (10° C)
 - a) Initial set: 12 hours
 - b) Final set: 18 hours

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 2. Where finishing is required, complete assembly, including welding of units, before start of

finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

- B. Connections: Weld or bolt shop connections, as indicated.
- C. Bolt field connections, except where welded connections or other connections are indicated.
 - 1. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
- D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325.
- E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.
- G. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
- H. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
- I. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.3 SHOP PAINTING

- A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.
- B. Do not paint surfaces which are to be welded.
- C. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures painting Council (SSPC) as follows:
 - 1. SP-3 "Power Tool Cleaning".
- E. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION

- A. Surveys:
 - 1. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.
- B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

- D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
 - 1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
- E. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- F. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- G. Pack grout solidly with non-metallic shrinkage resistant grout between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
- H. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure within specified AISC tolerances.
 - 2. Splice members only where indicated and accepted on shop drawings.
 - 3. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 4. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- I. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- J. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.2 PREPARATION

- A. The Contractor shall employ and pay an independent laboratory acceptable to Architect to conduct shop and field inspections and tests.
- B. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.
- C. Shop Bolted Connections: Inspect in accordance with AISC specifications.
- D. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
 - 3. Perform Ultrasonic or radiographic test on all groove welds.

- E. Field Bolted Connections: Inspect in accordance with AISC specifications.
- F. Field Welding: Inspect and test during erection of structural steel as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds. Perform Ultrasonic or radiographic test on all groove welds.

END OF SECTION

SECTION 05210 - STEEL JOISTS

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of steel joists is shown on drawings, including basic layout and type of joists required.

1.3 QUALITY ASSURANCE

Provide joists fabricated in compliance with the following, and as herein specified.

- A. SJI "Standard Specifications, Load Tables and Weight Tables" for:
 - 1. K - Series Open Web Steel Joists.
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure".
- C. Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of steel joists for testing purposes will be born by Owner if welds are found to be satisfactory. Remove and replace work found to be defective and provide new acceptable work.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI "Specifications".
- B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, jointing and accessories. Include mark, number, type, location and spacing of joists and bridging.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI "Specifications".
- B. High-Strength Threaded Fasteners: ASTM A 325 or A 490 heavy hexagon structural bolts with nuts and hardened washers.
- C. Steel Prime Paint: Manufacturer's standard.

2.2 FABRICATION

- A. General: Fabricate steel joists in accordance with SJI "Specification".
- B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
- C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications" and load tables.
- D. Ceiling Extensions: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2" of finished wall surface unless otherwise indicated.

- E. Bridging: Provide horizontal and cross bridging, complying with SJI "Specifications", and as shown on structural drawings.
 - 1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.
- F. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications", unless otherwise indicated.
- G. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.
 - 1. Apply one shop coat of primer paint to steel joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Erector shall examine areas and conditions under which steel joists are to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Erector.

3.2 ERECTION

- A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.
- B. Anchors: Furnish weld plates and other devices to be built into concrete and masonry construction.
 - 1. Refer to Division-3 sections for installation of anchors set in concrete.
- C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
 - 1. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
- D. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. Connect cross bridging at intersection of bridging members.
- E. Fastening Joists:
 - 1. Field weld joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
- F. Touch-Up Painting: After joist installation, paint field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

END OF SECTION

SECTION 05310 - STEEL DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Roof deck.
- B. Bearing plates and angles.
- C. Stud shear connectors.

1.2 RELATED REQUIREMENTS

- A. Section 05120 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.
- B. Section 05210 - Steel Joist Framing: Placement of embedded steel anchors for bearing plates and joist seats in cast-in-place concrete.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.
- C. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- G. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.
- H. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.
- I. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; 2016.
- J. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; 2016.
- K. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- M. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Field Quality Control:
 - 1. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - 2. Field welds will be subject to inspection.
 - 3. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
 - 4. Remove and replace work that does not comply with specified requirements.
 - 5. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Steel Deck:
 - 1. Canam Steel Corporation/United Steel Deck; www.canam-construction.com/en/construction-products/steel-deck/
 - 2. Cordeck, Inc; www.cordeck.com
 - 3. Nucor-Vulcraft Group; www.vulcraft.com/#sle.
 - 4. CSI; www.versa-roof.com
 - 5. Epic Metals Corporation; www.epicmetals.com
 - 6. Substitutions: See Section 01600 - Product Requirements.

2.2 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
 - 1. Calculate to structural working stress design and structural properties specified.
 - 2. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.
- B. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 - 3. Minimum Base Metal Thickness: As indicated on drawings. Otherwise, 22 gage, 0.0299 inch (0.76 mm).
 - 4. Nominal Height: As indicated on drawings. Otherwise 1-1/2 inch. (38 mm).
 - 5. Profile: Fluted; SDI NR.
 - 6. Formed Sheet Width: As Indicated on drawings.
 - 7. Side Joints: Lock seam or Mechanically Fastened.
 - 8. End Joints: Lapped, welded.
 - 9. Fire Resistance Classification: Comply with UL (FRD) Assembly Number if fire rated assembly is required.

2.3 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.
- B. Stud Shear Connectors: Made from ASTM A108 Grade 1015 bars.
- C. Welding Materials: AWS D1.1/D1.1M.
- D. Fasteners: Galvanized hardened steel, self tapping.
- E. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
 - 1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

2. Material: Steel; ASTM A510/A510M, Grade 1077.
 - a. Hardness: Rockwell C 54.5, minimum.
 - b. Tensile Strength: 285 kips per square inch, minimum.
 - c. Shear Strength: 175 kips per square inch, minimum.
 - d. Washers:
 - i. Steel Bar Joist Framing Applications: 0.472 inch diameter, minimum.
 - ii. Exposed Roof Deck Applications: 0.591 inch diameter, minimum.
 - e. Corrosion Resistance:
 - i. Steel Bar Joist Framing Applications: ASTM B633, SC1, Type III zinc electroplate.
- F. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
 1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM)SDI design method for roof deck and floor deck applications and ICC-ES AC43.
 2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.
 3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.
- G. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.
- I. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.4 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage, 0.0299 inch (0.76 mm) thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On concrete and masonry surfaces provide minimum 4inch (100 mm) bearing.
- C. On Steel supports provide minimum 1-1/2 inch (38 mm) bearing.
- D. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
 1. Welding: Use fusion welds through weld washers.
 2. Place and secure special deep fluted sections for integral concrete bridging.
- E. Clinch lock seam side laps.
- F. At mechanically fastened male/female side laps fasten at 24 inches on center maximum.
- C. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.
- D. At welded male/female side laps weld at 18 inches on center maximum.

- E. Weld deck in accordance with AWS D1.3/D1.3M.
- F. At deck openings from 6 inches to 18 inches in size, provide 2 by 2 by 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- K. At deck openings greater than 18 inches in size, provide steel angle reinforcement. as specified in Section 05500.
- L. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- M. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- N. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- O. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- P. Place metal cant strips in position and fusion weld.
- Q. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- R. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- S. Weld stud shear connectors through steel deck to structural members below.
- T. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05400 - COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof trusses.

1.3 DEFINITIONS

- A. Definition below is based on description of delivered minimum thickness in AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- B. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thickness shall be permitted at bends due to cold forming.
- C. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing members, connectors, and fasteners capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
- B. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
- C. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - 1. Upward and downward movement of 1/2 inch.
 - 2. Maximum live load deflection of 1/360 of span.
 - 3. Maximum total load deflection of 1/240 of span.
- D. Design roof trusses according to AISI's "Design Guide for Cold-Formed Steel Trusses."

1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacing, sizes, thickness, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
- C. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. 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.
- G. Fastener Test Reports: From a qualified testing agency indicating that each of the following fasteners comply with requirements, based on comprehensive testing of current products:

1. Power-actuated anchors.
 2. Self-drilling screws.
 3. Miscellaneous mechanical fasteners.
- H. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing 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. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, connection details, and other structural data. The complete design of the trusses and all supplemental framing for the system shall be the responsibility of the supplier.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- G. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- H. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the work include, but are not limited to, the following:
1. Tennessee Building Components Inc. (Formerly Raney Truss Company); 41 Sevier lane, Decaturville, TN 38329; Ph.: 731.852.2552. <https://www.linkedin.com/company/tennessee-building-components/>
 2. Metal Truss, L.L.C.

- B. Metal Framing Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
1. Allied American Studco, Inc.
 2. Angeles Metal Systems.
 3. California Expanded Metal Products Co.
 4. California Metal Systems, Inc.
 5. Clark Steel Framing Industries.
 6. Consolidated Fabricators Corp.
 7. Consolidated Systems, Inc.
 8. Dale Industries, Inc.
 9. Design Shapes in Steel.
 10. Knorr Steel Framing Systems.
 11. MarinoWare; Div. of Ware Industries, Inc.
 12. Scafco Corp.
 13. Steel Construction Systems.
 14. Steel Developers, LLC.
 15. Steeler, Inc.
 16. Studco of Hawaii, Inc.
 17. Super Stud Building Products, Inc.
 18. The Steel Network, Inc.
 19. United Metal Products, Inc.
 20. Western Metal Lath.

2.2 MATERIALS - ROOF TRUSSES

- A. Roof Truss Members: Fabricate top and bottom chords from unpunched sections that are symmetrical about the Y-Y axis. "C" Sections are not acceptable. Top and bottom cords shall be 18 gauge minimum. Web members shall be 20 gauge minimum.

2.3 MATERIALS - ANCHORS AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.
- B. Power-Actuated Fastening Systems: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- C. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
- D. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.4 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 ASTM A 780.

2.5 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Grout weld plate bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting weld plate at masonry construction.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
- E. Cut framing members by sawing or shearing; do not torch cut.
- F. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
- G. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- H. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

- I. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- J. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- K. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- L. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- M. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- N. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch. and as follows:
- O. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 TRUSS INSTALLATION

- A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.
 - 1. Truss Spacing: As indicated.
 - 2. Do not alter, cut, or remove framing members or connections of trusses.
 - 3. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
 - 4. Erect trusses without damaging framing members or connections.
 - 5. Install continuous bridging and permanently brace trusses as indicated on Drawings.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
 - 1. Field and shop welds will be subject to inspection and testing.
 - 2. Testing agency will report test results promptly and in writing to Contractor and Architect.
 - 3. Remove and replace Work that does not comply with specified requirements.
 - 4. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

END OF SECTION

SECTION 05500 - MISCELLANEOUS STEEL AND METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Definition: Metal fabrications include items made from iron and steel shapes, plates bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.
- B. Extent of metal fabrications is indicated on drawings and schedules.
- C. Types of work in this section include metal fabrications for:
 - 1. Rough hardware.
 - 2. Nosing.
 - 3. Loose bearing and leveling plates.
 - 4. Loose steel lintels.
 - 5. Miscellaneous framing and supports.
 - 6. Miscellaneous steel trim.
 - 7. Shelf angles.
 - 8. Steel railings.
 - 9. Pipe Bollards.

1.3 QUALITY ASSURANCE

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.
 - 1. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.
- C. Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. FERROUS METALS
 - 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
 - 2. Steel Structural, Shapes and Bars: ASTM A 36, wide flange, ASTM A572, fyz50ks.

MISCELLANEOUS STEEL FABRICATIONS

05500-1

3. Steel Tubing: Hot-rolled, ASTM A 500. FY=46KSI
4. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.
5. Galvanized Structural Steel Sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
6. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
7. Gray Iron Castings: ASTM A 48, Class 30.
8. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
9. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
10. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
11. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. FASTENERS

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
3. Lag Bolts: Square head type, FS FF-B-561.
4. Machine Screws: Cadmium plated steel, FS FF-S-92.
5. Wood Screws: Flat head carbon steel, FS FF-S-111.
6. Plain Washers: Round, carbon steel, FS FF-W-92.
7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
9. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

C. PAINT:

1. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.
2. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.

D. CONCRETE FILL:

1. Concrete Materials and Properties: Comply with requirements of Division-3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 3000 psi, and W/C ratio of 0.58 maximum, unless higher strengths indicated.
2. Non-Slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and non-glazing; unaffected by freezing, moisture or cleaning materials.

2.2 FABRICATION - GENERAL

- A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
- E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
 - 1. ASTM A_ 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
 - 3. ASTM A_ 386 for galvanizing assembled steel products.
- H. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- I. Shop Painting:
 - 1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 - a. Stripe paint all edges, corners, crevices, bolts, welds and sharp edges.
- J. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast cleaning".
 - 2. Interior (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

2.3 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division-6 sections.
- B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.4 LOOSE STEEL LINTELS

- A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown and scheduled. Weld adjoining members together to form a single unit where indicated.

Provide not less than 8" bearing at each side of openings, unless otherwise indicated. All steel lintels shall be hot-dipped galvanized steel.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.
- B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - 1. Except as otherwise indicated, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

2.6 FABRICATION - STEEL RAILINGS AND HANDRAILS

- A. Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.
 - 1. Handrails and Toprails: Capable of withstanding the following loads applied as indicated when tested per ASTM E 935.
 - 2. Concentrated Load: of 200lb applied at any point and any direction.
 - 3. Uniform load of 50 lb per linear ft. applied in any direction.
 - 4. Concentrated and uniform loads above need not be assumed to act concurrently.
 - 5. Guards: Intermediate rails, balusters and panel fillers capable of withstanding a uniform load of 25 lb per sq. ft. of gross area of guard, including any open areas, of which they are a part.
- B. Fabricate steel railings and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of steel tubing of shapes, sizes and wall thickness indicated, but not less than that required to support design loading.
- C. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - 1. At tee and cross intersections provide coped joints.
 - 2. At bends interconnect tubing by means of prefabricated elbow fittings or flush radius bends, as applicable, or radiuses indicated.
 - 3. At elbow bends provide mitered joints.
 - 4. Form bends by use of prefabricated elbow fittings and radius bends or by bending pipe, at fabricator's option.
- D. Form simple and compound curves by bending tubing in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.
- E. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.
- F. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.
- G. Toe Boards: Where indicated, provide toeboards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use a 4" high x 1/8" plate welded to, and centered between, each railing post.
- H. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of pipe and attachment of railings and

handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

1. For railing posts sets in concrete provide sleeves of galvanized steel pipe not less than 6" long and with an inside diameter not less than 1/2" greater than the outside dimensions of tubing. Provide steel plate closure welded to bottom of sleeve and of width and length not less than 1" greater than outside diameter of sleeve.
- I. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel railings and handrails, and as follows:
 1. Railings may be bent at corners, rail returns and wall returns, instead of using prefabricated fittings.
 2. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

2.7 IMPACT BOLLARDS

- A. Provide concrete filled steel pipe bollards as indicated on drawings as follows:
 1. Unless otherwise indicated, bollards are to be 4" Schedule 40 steel pipe.
 2. Locate bollards as indicated on drawings. Install bollards such that they are vertically aligned and plumb so they do not appear to lean from any direction.
 3. Install pipe to depth and heights as indicated on drawings.
 4. Pipe to be bedded and filled with concrete with hand-formed domed cap, as indicated on drawings.
 5. Prime and Paint pipe bollards. Color to be selected by architect.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION - GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
 1. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- C. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

- D. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
1. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

3.3 INSTALLATION - STEEL RAILINGS AND HANDRAILS

- A. Adjust railing prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
1. Anchor posts in concrete by means of sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
 2. Leave anchorage joint exposed; wipe off excess grout and level 1/8" build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows:
1. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
 2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
 3. For hollow masonry anchorage, use toggle bolts having square heads.
 4. For stud partitions use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.
- C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" of posts.
- D. Cast Treads and Thresholds: Install cast treads and thresholds with anchorage system indicated to comply with manufacturer's recommendations. Seal units exposed to exterior mastic to provide a watertight installation.

3.4 ADJUST AND CLEAN

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.
- B. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- C. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 05510 - METAL STAIRS

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Section specifies steel stairs with railings.
 - 1. Closed riser stairs with concrete filled treads and platforms.

1.3 RELATED WORK

- A. Concrete fill for treads and platforms: Section 03310, Cast In-Place Concrete.
- B. Wall handrails and railings for other than steel stairs: Section 05521, Pipe And Tube Railings.
- C. Requirements for shop painting: Section 09900, Painting.

1.4 SUBMITTALS

- A. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.

1.5 APPLICATION PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.
 - 1. American Society for Testing and Materials (ASTM):
 - a. A36/A36M-04, Structural Steel
 - b. A47-99 (R2004), Ferritic Malleable Iron Castings
 - c. A48-03, Gray Iron Castings
 - d. A53-04, Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
 - e. A307-04, Carbon Steel Bolts and Studs, 60000 psi Tensile Strength
 - f. A653/653M-04, Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot-Dip Process
 - g. A563-04, Carbon and Alloy Steel Nuts
 - h. A1008-04, Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low-Alloy
 - i. A786/A786M-00., Rolled Steel Floor Plates
 - j. A1011-04, Steel, Sheet and Strip, Strip, Hot-Rolled Carbon, Structural, High-Strength, Low-Alloy
 - 2. American Welding Society (AWS):
 - a. D1.1-00., Structural Welding Code-Steel
 - b. D1.3-98, Structural Welding Code-Sheet Steel
 - 3. The National Association of Architectural Metal Manufacturers (NAAMM) Manuals:
 - a. Metal Bar Gratings (ANSI/NAAMM MBG 531-93)
 - b. 2nd Edition-1985, Pipe Railing Manual, Including Round Tube
 - 4. American Iron and Steel Institute (AISI):
 - a. Specification for the Design of Cold-Formed Steel Structural Members

PART 2 – PRODUCTS

2.1 DESIGN CRITERIA

- A. Design stairs to support a live load of 500 kg/m² (100 pounds per square foot).
- B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.
- C. Design Grating treads in accordance with NAAMM Metal Bar Grating Manual.
- D. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point.

2.2 MATERIALS

- A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.
- B. Sheet Steel: ASTM A1008.
- C. Structural Steel: ASTM A36.
- D. Steel Floor Plate: ASTM 786.
- E. Steel Decking: Form from zinc coated steel conforming to ASTM A446, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.
- F. Steel Plate: ASTM A1011.
- G. Iron Castings: ASTM A48, Class 30.
- H. Malleable Iron Castings: ASTM A47.

2.3 FABRICATION GENERAL

- A. Fasteners:
 - 1. Conceal bolts and screws wherever possible.
 - 2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.
- B. Welding:
 - 1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.
 - 2. Where possible, locate welds on unexposed side.
 - 3. Grind exposed welds smooth and true to contour of welded member.
 - 4. Remove welding splatter.
- C. Remove sharp edges and burrs.
- D. Fit stringers to head channel and close ends with steel plates welded in place where shown.
- E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.
- F. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09900, Painting.
- G. Provide guard railings not less than 1060 mm (42-inches) high.

2.4 RAILINGS

- A. Fabricate railings, including handrails, from steel pipe with flush.
 - 1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
 - 2. Wall handrails are provided under Section 05521, Pipe And Tube Railings.
- B. Return ends of handrail to wall and close free end.

- C. Provide standard terminal castings where fastened to newel.
- D. Space intermediate posts not over six feet on center between end post or newel post.
- E. Fabricate handrail brackets from cast malleable iron.
- F. Provide standard terminal fittings at ends of post and rails.

2.5 CLOSED RISER STAIRS

- A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.
- B. Fabricate pans for treads and platforms, and risers from sheet steel.
- C. Form risers with sanitary cove.
- D. Fabricate stringers, headers, and other supporting members from structural steel.
- E. Construct newel posts of steel tubing having wall thickness not less than 5 mm (3/16-inch), with forged steel caps and drops.

PART 3 - EXECUTION

3.1 STAIR INSTALLATION

- A. Provide hangers and struts required to support the loads imposed.
- B. Perform job site welding and bolting as specified for shop fabrication.
- C. Set stairs and other members in position and secure to structure as shown.
- D. Install stairs plumb, level and true to line.
- E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall.
- F. Weld and finish with prime and paint finish of adjoining steel.

3.2 RAILING INSTALLATION

- A. Install standard terminal fittings at ends of posts and rails.
- B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.
- C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).
- D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

3.3 FIELD PRIME PAINTING

- A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.
- B. Touch-up abraded areas with same primer paint used for shop priming.
- C. Touch up abraded galvanized areas with zinc rich paint as specified in Section 09900, Painting.

END OF SECTION

SECTION 05515 - LADDERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aluminum Access Ladders.
- B. Aluminum Cage Ladders.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.
- B. Section 05500 – Metal Fabrications: Fasteners and installation requirements used to attach ladders to structure.
- C. Section 14200 – Elevators
- D. Section 15050 – Basic Electrical Materials and Methods: For electrical grounding of ladders.

1.3 REFERENCES

- A. AA – Aluminum Association.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. OSHA 1910.27 – Fixed Ladders.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01320 or 01330.
- B. Product Data: Manufacturer's data sheets on each product.
- C. Shop Drawings:
 - 1. Detail fabrication and erection of each ladder indicated. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. Provide reaction loads for each hanger and bracket.
- D. Qualification Data:
 - 1. Refer to Quality Assurance provisions for submittal requirements evidencing experience, certifications and resources.
- E. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors.
- F. Verification Samples: For each finish specified, two samples, minimum size 6 inches (150 mm) square, represent actual product color.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
 - 1. Record of successful in-service performance.
 - 2. Sufficient production capacity to produce required units.
 - 3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.
- B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and

installing ladders to attain designed operational and structural performance.

- C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Install ladder in area designated by Architect.
 - 2. Do not proceed with remaining work until workmanship and installation are approved by Architect.
 - 3. Rework mock-up as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurement before fabrication.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

1.8 WARRANTY

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall repair, replace, or refund the purchase price of defective ladder.

1.9 EXTRA MATERIALS

- A. Furnish touchup kit for each type and color of paint finish provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. O'Keeffe's, Inc.; 100 N Hill Drive, Suite 12, Brisbane, CA 94005. Toll Free Tel: (888) 653-3333. Tel: (415) 824-4900. Fax: (415) 824-5900. Email: info@okeeffes.com. Web: <http://www.okeeffes.com>.
 - 2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the architect no later than Ten (10) days prior to bid opening.
 - 3. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 APPLICATIONS/SCOPE

- A. Fixed and Cage Ladder Design:
 - 1. Safety cages are required on ladders over 20 feet (6096 mm)
 - 2. Safety cages are required on all ladders in high or hazardous areas.

3. Landing platforms are required at 30 feet (9144 mm) above the bottom of the ladder.

B. Fixed Access Ladder:

1. Standard Duty Channel Rail.
 - a. Model 500 as manufactured by O’Keeffe’s Inc.
 - b. Finish: Paint. Urethane over chemically pretreated substrate.
Caution Yellow (RAL 1018).
 - c. **Location: Elevator Pit**

C. Cage Ladder:

1. Cage Ladder with High Parapet Access, Platform and Return.
 - a. Model 533A as manufactured by O’Keeffe’s Inc.
 - b. Finish: Mill finish. As extruded.
 - c. **Location: At roofs as Indicated on drawings.**

2.3 FINISHES

- A. Mill finish. As extruded.
- B. Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.
- C. Paint. Urethane over chemically pretreated substrate.
 1. Fire Red (RAL 2002).
 2. Alert Orange (RAL 2003).
 3. Warning Blue (RAL 5005).
 4. Caution Yellow (RAL 1018).
 5. Safety Green (RAL 6001).
 6. As scheduled on drawings.

2.4 MATERIALS

- A. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
- B. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.

2.5 FABRICATION

- A. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18–3/8 inches (467mm) long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
 1. Rungs shall withstand a 1,500 pound (454 kg) load without deformation or failure.
- B. Channel Side Rails: Not less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide.
- C. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
- D. Ship Ladders: Not less than 1-1/4 inches (32mm) high, 4-1/8 inch (105 mm) deep and 2 feet (610 mm) wide; tread spacing shall be 1 foot (305 mm) on center. Handrails shall be aluminum pipe, not less than 1-1/2 inches (38 mm) in diameter with hemispheric end caps.
- E. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches (1067 mm) above the landing and shall be fitted with deeply serrated, square, tubular grab rails.
- F. Landing Platform: 1-1/2 inches (38 mm) or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.

- G. Security Doors: Formed 1/8 inch (3 mm) thick aluminum sheet. Security panels shall extend on both sides, perpendicular to the door face, to within 2 inches (51 mm) of the wall. Security door shall be furnished with continuous aluminum piano hinge and heavy duty forged steel locking hasps.
- H. Ship Ladder Seismic Bottom Support: Manufacturer's standard; two isolation bearings per stringer.
- I. Ladder Safety Post: Retractable hand hold and tie off.
- J. Safety Cages:
 - 1. Fabricate ladder safety cages to comply with authority having jurisdiction. Assemble by welding. Spacing of primary hoops, secondary hoops and vertical bars shall not exceed that required by code.
 - 2. Safety cage hoops and vertical bars: 3/16 inch (5 mm) by 2 inches (51 mm) aluminum bar.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.
- B. Do not begin installation until supporting structure is complete and ladder installation will not interfere with supporting structure work.
- C. If supporting structure is the responsibility of another installer, notify Architect of unsatisfactory supporting work before proceeding.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05540 - METAL STUDS

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Types of work include:
 - 1. Light-gage metal support system for installation of gypsum and other materials.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where gypsum drywall systems with fire- resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No.'s. in GA "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions, including other data as may be required to show compliance with these specifications.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store material inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Alabama Metal Industries Corp.
 - 2. Bostick Steel Framing Co.
 - 3. Ceco Corp.
 - 4. Dale Industries, Inc.
 - 5. Marinoware, Inc.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 METAL FRAMING

- A. Fabrication: Fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A446, A570 or A611.
- B. Finish: Provide galvanized finish to metal framing components complying with ASTM A525 for minimum G60 coating.

- C. "C"-Shape Studs and Resilient Channels. Provide as follows:
 1. Manufacturer's standard 22 gauge at all interior gypsum board locations, size to be as noted on the drawings.
 2. Gauge at all exterior locations to be 18 gauge at exterior walls or as noted on the Structural Drawings, size to be as noted on the drawings.
 3. Resilient hat channels, 18 gauge, size as noted on the drawings.
- D. "C"H-Shape Studs: Provide manufacturer's standard 20 gauge unless otherwise noted on the Structural Drawings, size to be as noted on the drawings.
- E. Fastenings: Attach components by welding, bolting, or screw fastenings, as standard with manufacturers.

2.3 INSTALLATION

- A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners, or 16" o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.
 1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
 2. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
 3. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- C. Installation of Wall Stud System: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
 1. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
 2. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Space framing member 24" o.c., unless noted otherwise on the drawings or by UL Classification.
- B. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.
- C. Supplementary Supports:
 1. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of

"Gypsum Construction Handbook" published by United States Gypsum Co.

2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
3. Extend supplementary supports to the structural support system.
4. Frame openings to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co. Attach vertical studs at jambs directly to frames; install runner track section (for jack studs) at head and secure to jamb studs.
5. Erect thermal insulation vertically. Until gypsum board is installed hold insulation in place with 18-gage tie wire or by an equally acceptable method.

END OF SECTION

SECTION 05540 - METAL STUDS

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Types of work include:

1. Cold Form Metal Framing for the exterior walls and parapets

4.2. Light-gage metal support system for installation of interior gypsum and other materials.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where gypsum drywall systems with fire- resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No.'s. in GA "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions, including other data as may be required to show compliance with these specifications.
- B. Shop Drawings:
 - a. The contractor shall employ a Specialty Structural Engineer (SSE) to design all members and associated connection of the cold-formed metal framing.
 - b. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - c. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - d. Shop drawings shall be stamped by a professional engineer registered in the jurisdiction of the project.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store material inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Alabama Metal Industries Corp.
 - 2. Bostick Steel Framing Co.
 - 3. Ceco Corp.

4. Dale Industries, Inc.
 5. Marinoware, Inc.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 METAL FRAMING

- A. Fabrication: Fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A446, A570 or A611.
- B. Finish: Provide galvanized finish to metal framing components complying with ASTM A525 for minimum G60 coating.
- C. "C"-Shape Studs and Resilient Channels. Provide as follows:
1. Manufacturer's standard 22 gauge (minimum) at all interior gypsum board locations, size to be as noted on the drawings.
 2. Gauge at all exterior locations to be ~~18 gauge at exterior walls or as noted on the Structural Drawings sized and detailed by the SSE.~~ Size to be as noted on the shop drawings.
 3. Resilient hat channels, 18 gauge, size as noted on the drawings.
- D. "C"H-Shape Studs: Provide manufacturer's standard 20 gauge unless otherwise noted on the Structural Drawings, size to be as noted on the drawings.
- E. Fastenings: Attach components by welding, bolting, or screw fastenings, as ~~standard with manufacturers indicated by the SSE.~~

2.3 Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

- A. Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated
- B. Design Loads: As indicated.
- C. Deflection Limits: Design framing systems to withstand design loads without horizontal deflections greater than those noted below:
- a. Metal Panel Finish L/240
 - b. Brick Veneer Finish L/600
- D. Deflection Connectors: used to accommodate upward and downward vertical displacement of primary structure through positive mechanical attachment to structure and screw attachment to stud web using step-bushings or deflection tracks to permit frictionless vertical and horizontal movement.
- E. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
- F. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as determined by the exterior wall system.
- G. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- H. Cold-Formed Steel Framing Design Standards:
- a. Wall Studs: AISI S211.
 - b. Headers: AISI S212.

- c. Lateral Design: AISI S213.
- d. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- I. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- J. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.32.4 INSTALLATION

- A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as specified by SSE or recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners, or 16" o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.
 - 1. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
 - 2. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
 - 3. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- C. Installation of Wall Stud System: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
 - 1. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
 - 2. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Space framing member 24" o.c., unless noted otherwise on the drawings or by UL Classification.
- B. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.
- C. Supplementary Supports:
 - 1. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co.

2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
3. Extend supplementary supports to the structural support system.
4. Frame openings to comply with details indicated or if not otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co. Attach vertical studs at jams directly to frames; install runner track section (for jack studs) at head and secure to jamb studs.
5. Erect thermal insulation vertically. Until gypsum board is installed hold insulation in place with 18-gage tie wire or by an equally acceptable method.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

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 work of this section.
- B. Work Included: All wood, nails, bolts, screws, framing anchors and other rough hardware, and all other items needed for rough and finished carpentry in this work but not specifically described in other sections of these specifications.
- C. Quality Assurance: In addition to complying with all pertinent codes and regulations, all materials of this section shall comply with pertinent provisions of:
 - 1. Southern Pine Southern Pine Inspection Bureau Plywood ‘Softwood Plywood - Construction and Industrial’ (Amended June 1969), Product Standard PD 1-66 of U.S. Department of Commerce, Bureau of Standards, and A.P.A.
 - 2. Rough Hardware “Specification for the Design, Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction”
 - 3. Building Paper Federal Specification UU-B-790a, dated February 5, 1968
 - 4. Wood Preservative Standard P-5 of the American Wood Preservers Institute
 - 5. Other Similar and pertinent reference standards for the products needed.
- D. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.
- E. Qualifications of Workmen: Provide sufficient skilled workmen and supervisors who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.
- F. Rejection: In the acceptance or rejection of rough carpentry, no allowance will be made for lack of skill on the part of workmen.

1.2 PRODUCT HANDLING

- A. Protection: Store all materials in such a manner as to ensure proper ventilation and drainage and to protect against damage and the weather.
 - 1. Use all means necessary to protect lumber materials before, during and after delivery to the job site, and to protect the installed work and materials of all other trades.
 - 2. Deliver the materials to the job site and store all in a safe area, out of the way of traffic, and shored up off the ground surface.
 - 3. Protect all metal products with adequate weather-proof outer wrappings.
 - 4. Use extreme care in the off-loading of lumber to prevent damage, splitting and breaking of materials.
 - 5. Keep all material clearly identified with all grade marks legible; keep all damaged material clearly identified as damaged, and separately stored to prevent its inadvertent use.
 - 6. Do not allow installation of damaged or otherwise non-complying material.
 - 7. Use all means necessary to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 – MATERIALS

2.1 MATERIALS - GENERAL

- A. Grade Stamps:
- B. Framing Lumber: Identify all framing lumber by proper grade stamp.
- C. Plywood: Identify all plywood as to species, grade and glue type by the stamp of the American Plywood Association.
- D. Other: Identify all other materials of this section by the appropriate stamp of the agency listed in the reference standards, or by such other means as are approved in advance by the Architect.
- E. Moisture Content: Moisture content of any material for framing not to exceed 19% for boards 8" in width or less. Boards exceeding 8" in width not to exceed 15% at time of installation. All material used for finish and trim work to be kiln dried material with moisture content not to exceed that allowed by FHA for intended use.

2.2 MATERIALS - WOOD

- A. All materials of this Section, unless specifically otherwise approved in advance by the Architect, shall meet or exceed the following:
 - 1. Plates, Grounds or furring
 - a. Pressure treated #2 KD Southern Yellow Pine in contact w/concrete, masonry or plaster
 - 2. Gypsum Sheathing:
 - a. 5/8" exterior grade fiberglass mat-faced gypsum sheathing
 - i. Georgia Pacific Dens-Glass Fireguard Sheathing: ASTM C1177, Type X.
 - ii. R-Value of 0.67.
 - b. Vapor Barrier:
 - i. The General Contractor shall furnish and install a TAMKO® TW Moisture Wrap, flexible, 40-mil, self-adhering, over all exterior wall sheathing
 - 3. All Framing Members
 - a. Lodge Pole Spruce #2 KD
 - 4. Wood Preservative
 - a. Ammonical copper arsenite or 5% solution of pentachlorophenol

2.3 MATERIALS – MISCELLANEOUS

- A. All materials of this Section, unless specifically otherwise approved in advance by the Architect, shall meet or exceed the following:
 - 1. Steel Hardware
 - a. ASTM A-7 or A-36 (Use galvanized at exterior locations)
 - 2. Machine Bolts
 - a. ASTM A-307
 - 3. Lag Bolts
 - a. Federal Specifications FF-B-561
 - 4. Nails
 - a. Common (Except as noted) Federal Specifications FF-N-1-1 (Use galvanized at exterior locations)

5. Flashing

- a. Nervastral Seal Prof HD-20 except where metal is indicated. Nervastral Seal Prof HD shall be installed on all sills and heads ½" inward from outside face of wall and extended 6" on each side of opening brick veneer construction. The sheeting shall not be allowed to hang free prior to completion of brick work but shall be secured to the siding with nails and discs or furring strips.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Stockpiling: Stockpile all materials sufficiently in advance of need to ensure their availability in a timely manner for this work.
- B. Delivery Schedules: Make as many trips to the job site as are necessary to deliver all materials of this section in a timely manner to ensure orderly progress of the total work.
- C. Compliance: Do not permit materials not complying with the provisions of this section of these specifications to be brought onto or to be stored at the job site; immediately remove from the job site all non-complying materials and replace them with materials meeting the requirements of this section.
- D. Inspection: Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 1. Verify that rough carpentry may be performed in strict accordance with the original design and all pertinent codes and regulations.
- E. Discrepancies: In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- F. Workmanship: All rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the drawings and with all pertinent codes and regulations.
- G. Selection of Lumber Pieces: Carefully select all members; select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections.
 1. Cut out and discard all defects which render a piece unable to serve its intended functions; lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
- H. Shimming: Do not shim sills, joists, short studs, trimmers, headers, lintels, or other framing components.
- I. Treated Lumber: Use only treated lumber for all wood blocks and nailing grounds, etc. (other than foundation grade redwood) in, or in contact with, concrete.
- J. Treatment: Treat all wood less than two feet above finished grade by spraying with the preservative specified in this section of these specifications, to a minimum distance of six inches from the ends, or otherwise treat as approved in advance by the Architect. Perform all treatment in strict accordance with published recommendations of the manufacturer of the treatment preservative.
- K. General Framing: In addition to all framing operations normal to the fabrication and erection indicated on the drawings, install all backing required for the work of other trades. Set all horizontal or sloped members with crown up. Do not notch, bore, or cut members for pipes ducts conduits, or other reasons except as shown on the drawings or as specifically approved in advance by the Architect.

- L. Bearing: Make all bearings full unless otherwise indicated on the drawings. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support; where framing members slope, cut or notch the ends as required to give uniform bearing surface.
- M. Blocking: Install all blocking required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas.
 - 1. All other locations where openings could afford passage for rodents or flames.
 - 2. Fire-block in the following specific locations:
 - a. In all stud walls at ceiling and floor levels.
 - b. In all stud walls, including furred spaces, so that the maximum dimension of each concealed space is not more than eight feet.
 - c. All other locations where openings could afford passage for rodents or flames.
- N. Stud Walls and Partitions: Make all studs single length, unspliced, and platform framed.
- O. Corners and intersections: Unless otherwise indicated on the drawings, frame all corners and intersections with three or more studs and all required bearing for wall finish.
- P. Alignment: On all framing members to receive a finished wall or ceiling, align the finish subsurface to vary not more than 1/8 inch from the plane of surfaces of adjacent framing and furring members.
- Q. Nailing: Use only common wire nails or spikes except where otherwise specifically noted in the drawings.
 - 1. Provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike provided, however, that 16 d nails may be used to connect two pieces of the two inch (nominal) thickness.
 - 2. Do all nailing without splitting wood, preboring as required; replace all split members.
- R. Bolting: Drill holes 1/16 inch larger in diameter than the bolts being used; drill straight and true from one side only. Bolt threads must not bear on wood; use washers under head and nut where both bear on wood; use washers under all nuts.
- S. Screws: For lag screws and wood screws, prebore holes same diameter as root of thread; enlarge holes to shank diameter for length of shank.
 - 1. Screw all lag screws and wood screws. Do NOT Drive screws.
- T. Installation of Building Paper: Install the specified building paper over all exterior framing members where indicated to be installed, lapping all joints to prevent penetration of water into the stud spaces, and securely fastening the paper in place in accordance with the manufacturer's published recommendations.
- U. Cleaning Up: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends, and debris.

END OF SECTION

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Definition: Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections. Types of finish carpentry work in this section include:
 - 1. Interior running and standing trim.
 - 2. Exterior Finish Carpentry- Facia and Shingle Strip

1.3 SUBMITTALS

- A. Product Data: Indicate Product description including product information and compliance with specified performance requirements.
- B. Shop Drawings: Submit Shop Drawings for work of this Section in accordance with section 01600. Indicate plans, sections, dimensions, component sizes, edge details, fabrication details, attachment provisions, sizes of furring, blocking, including concealed blocking and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for receptacles and other items installed in the specified product.
- C. Samples: Submit samples in accordance with Section 01300. Submit minimum 2' x 2' samples.
 - 1. Cut sample and seam together for representation of inconspicuous seam. Indicate full range of pattern variation. Approved samples will be retained as standards for work.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials, until operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

PART 2 - PRODUCTS

2.1 MATERIALS - INTERIOR

- A. Standing and Running Trim for Painted Finish
 - 1. Moldings, Bases, Casings, Crowns and Miscellaneous Trim: "B" and better fir or poplar, sizes and shapes as indicated on plans.

2.2 MATERIALS - EXTERIOR

- A. Facia and Shingle Strip:
 - 1. 1x to match existing in #2 spruce, pine or fir – painted.

2.3 FABRICATION

- A. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.

- B. Moisture Content of Softwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
- C. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.
 - 1. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).
- D. Inspect each piece of lumber and plywood or each unit of finish carpentry after drying; do not use twisted, warped, bowed or otherwise damaged or defective wood.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
- B. Back-prime lumber for finish exposed on the exterior or to moisture and high relative humidity on the interior. Comply with requirements of section on painting within Division 9 for primers and their application.

3.2 INSTALLATION

- A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining and 1/8" maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.
- E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
- C. Refer to Division 9 for final finishing of installed finish carpentry work.
- D. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 06240 – PLASTIC LAMINATE COUNTERTOPS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Plastic Laminate Countertops.
- B. Plastic Laminate Splashes.

1.2 RELATED REQUIREMENTS

- A. Section 06100 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 06241 – Solid Surface Fabrications - Counters.

1.3 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- C. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.
- E. PS 1 - Structural Plywood; 2009.

1.4 SUBMITTALS

- A. See Section 01600 - Product Requirements, for submittal procedures.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of cutouts and holes as required for items installed in plastic-laminate countertops.
- C. Product Data: Provide data for hardboard, medium density fiberboard, particleboard, plywood, high pressure decorative laminate, adhesive for bonding plastic laminate, thermoset decorative overlay, and accessories.
- D. Initial Samples: Provide manufacturers full range samples.
- E. Verification Samples: Submit four actual samples minimum 12 inches square, for each plastic laminate color, pattern and surface finish as selected by architect for verification and final selection(s).
- F. Product Certificates: Signed by manufacturers of laminate certifying that products furnished comply with requirements.
 - 1. High Pressure decorative laminate.
 - 2. Chemical Resistant, high pressure decorative laminate.
 - 3. Adhesives.
- G. 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 address of architects and owners, and other information specified.
- H. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- I. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
- B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Premium quality, unless other quality is indicated for specific items.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience. Member in good standing of the Architectural Woodwork Institute (AWI) and familiar with the AWI/AWMAC QSI.
- D. Quality Certification: Provide inspection and quality certification of completed custom cabinets in accordance with AWI/AWMAC Quality Certification Program.
- E. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 MOCK-UP

- A. Provide mock-up of typical laminate top.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.7 PRE-INSTALLATION MEETING

- A. Convene not less than one week before starting work of this section.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that countertops can be supported and installed as indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If woodwork must be stored in other installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 1. Locate concealed framing, blocking, and reinforcements that support countertops by field measurements before being enclosed and indicate measurements on shop drawings.
 2. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating countertops without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 – PRODUCTS

2.1 PLASTIC LAMINATE COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for grades indicated for construction, installation and other requirements.

PLASTIC LAMINATE COUNTERTOPS
06240-2

1. Provide labels from AWI certification program indicating that countertops comply with requirements of grades specified.
 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- C. Adhesives or fasteners to be provided for securing of tops to cabinet work. Such materials to allow for contraction or expansion of tops where necessary.
- D. Laminate Type: Fire rated type, 0.050" thick; UL tested and labeled ratings of 25 for flame spread, 25 for fuel contributed and 100 for smoke developed when bonded to wood particle board.
- E. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Formica Corporation.
 - b. Nevamar; a Panolam Industries International, Inc. brand.
 - c. Wilsonart International Holdings, Inc.
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As Selected by Architect from manufacturers solid and pattern range.
 2. A maximum of Two (2) colors per project.
 3. Grain Direction: Parallel to cabinet fronts (If applicable).
- G. Core Material: Particleboard or medium-density fiberboard.
- H. Core Material at Sinks: Marine-grade plywood, medium-density fiberboard made with exterior glue or exterior-grade plywood
- I. Core Thickness: 3/4 inch.
1. Build up countertop thickness to 1-1/8" inch, unless otherwise specified, with additional layers of core material laminated to top.
- J. Edge Treatment: All exposed edges must be same laminate cladding on horizontal surfaces.
1. Build up front edge thickness to 1-1/8" inch, unless otherwise specified, with additional core material laminated to top.
- K. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.
- L. Paper Backing: Provide paper backing on underside of countertop substrate.
- M. Splashes: All Countertops shall be provided with 4" high back splashes and side splashes with thickness matching countertop thickness where shown and where tops abut walls, columns, case ends, adjacent cabinets, etc.
1. All exposed edges, including back and end splashes, must be covered with the same laminate as countertop surfaces.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.
- B. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Softwood Plywood: DOC PS 1.

2.3 SHOP TREATMENT OF WOOD MATERIALS

- A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
- B. Provide UL approved identification on fire retardant treated material.
- C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.5 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Concealed Joint Fasteners: Threaded steel.

2.6 HARDWARE

- A. Grommets for Cable Passage through Countertops: Mockett BRV1, Satin Nickel finish.
- B. Metal Slot Grommet: Mockett Max2/D-94, Satin aluminum finish.
- C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Nickel unless otherwise indicated in this specification.
- D. Countertop Supports: Powder coated, formed metal supports. Must provide attachment points between countertop and wall.

2.8 FABRICATION

- A. Sand wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated.
- C. Ease edges to radius indicated for the following:
 1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
- D. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- E. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 1. Seal edges of openings in countertops with a coat of varnish.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of blocking and support framing.

3.2 INSTALLATION

- A. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
 2. Seal edges of cutouts by saturating with varnish.
- B. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy- clamping pressure at joints.
- C. When splice joints are required, they shall be joined as needed for a gapless joint.
- D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
Secure backsplashes to walls with adhesive.
 2. Seal junctures of tops, splashes, and walls with mildew-resistant colored silicone sealant or another colored permanently elastic sealing compound recommended by countertop material manufacturer. Sealant color shall be color-match to countertop laminate.

3.3 ADJUSTING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace countertop. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

- A. The contractor is responsible for protection of countertops during construction through final inspection. Contractor shall use protection products approved by the laminate manufacturer.

END OF SECTION

SECTION 06410 - CUSTOM CABINETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Specially fabricated **Laminate Cabinets**.
- B. Cabinet hardware.
- C. Factory finishing.
- D. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

- A. Section 06100 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 04412 – Granite Counters.
- C. Section 06241 – Solid Surface Fabrications - Counters.

1.3 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- C. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- D. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2009 (ANSI/HPVA HP-1).
- F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.
- G. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2011.
- H. PS 1 - Structural Plywood; 2009.
- I. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.
- J. WI (MAN) - Manual of Millwork; Woodwork Institute; 2003.

1.4 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories, including cabinet hardware and accessories and finishing materials and processes. For hardboard, medium density fiberboard, particleboard, plywood, high pressure decorative laminate, adhesive for bonding plastic laminate, thermoset decorative overlay, solid surfacing material. cabinet hardware and accessories, and finishing materials and processes.
- D. Samples: Submit four actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, back and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

- F. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.
- G. 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 address of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
- B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Premium quality, unless other quality is indicated for specific items.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience. Member in good standing of the Architectural Woodwork Institute (AWI) and familiar with the AWI/AWMAC QSI.
- D. Quality Certification: Provide inspection and quality certification of completed custom cabinets in accordance with AWI/AWMAC Quality Certification Program.
- E. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodworking including wood doors when veneer matching includes door faces.

1.6 MOCK-UP

- A. Provide mock-up of typical base cabinet and wall cabinet, including hardware, finishes, and plumbing accessories.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.7 PRE-INSTALLATION MEETING

- A. Convene not less than one week before starting work of this section.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on shop drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Custom Grade.
- B. Plastic Laminate Faced Cabinets: Custom grade.

2.2 LUMBER MATERIALS

- A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as scheduled.
- B. Hardwood Lumber: NHLA; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as scheduled.

2.3 PANEL MATERIALS

- A. Softwood Faced Plywood: DOC PS 1, Medium Density Overlay.
- B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
 1. Use as backing for plastic laminate unless otherwise indicated.
- C. Core Material at Sinks: Marine-grade plywood, medium-density fiberboard made with exterior glue or exterior-grade plywood.

2.4 LAMINATE MATERIALS

- A. Manufacturers: Basis of Design as indicated on the Drawings.
 1. Substitutions: See Section 01600 - Product Requirements.
- B. Product: As indicated on the Drawings.
- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
 4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
- D. Melamine Laminate tested to meet NEMA Test LD 3.
- E. Colors for cabinet surfaces shall be selected from Wilsonart's standard solid and pattern offering. A maximum of one (1) color to be selected per unit face and two (2) colors per project.
- F. Melamine colors shall be light beige or dove grey. One color only per project.
- G. Colors: All To be selected by architect during submittal phase of project.

2.5 COUNTERTOPS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Adhesives or fasteners to be provided for securing of tops to cabinet work. Such materials to allow for contraction or expansion of tops where necessary.
- C. Tops shall be 1" thick unless otherwise specified and provided with 4" high back splashes with thickness matching countertop thickness where shown and where tops abut walls, columns, case ends, adjacent cabinets, etc.
- D. Types:
 - 1. Plastic laminate counter tops shall be surfaced with general purpose horizontal grade laminate. Cores shall be 1 1/8" built up wood front edge; #45 density particleboard.

All exposed edges, including back and end splashes, must be covered with the same laminate as top surfaces. When splice joints are required, they shall be joined with dowel pins and tite joint fasteners as needed for a gapless joint.
 - 2. Laminate Color Selection(s): Colors for countertops shall be selected from Wilsonart's standard solid and pattern offering. A maximum of Two (2) colors per project.
- E. Plastic Laminate Type: Fire rated type, 0.050" thick; UL tested and labeled ratings of 25 for flame spread, 25 for fuel contributed and I00 for smoke developed when bonded to wood particle board.

Preparations for Finishing: Comply with AWI Quality Standards, Section I500, for sanding, filling countersunk fasteners, backpriming and similar preparations for finishing of architectural woodwork, as applicable to each unit of work..

2.6 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.7 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using shelf brackets and coordinated shelf rests, satin chrome finish, for nominal 1 inch spacing adjustments. Comply with BHMA A156.9, B04102, with shelf brackets B04112.
- C. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments.
- D. Drawer and Door Pulls: Aluminum/stainless steel pull, 1'-0" long..
 - 1. Product: Item No. 112.83.006 manufactured by Westin Collection.
- E. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish. Comply with BMA A156.11, E07121.
- F. Drawer locks: Comply with BHMA A156.11, E07041
- G. Grommets for Cable Passage through Countertops: Mockett BRV1, Satin Nickel finish.

- H. Metal Slot Grommet: Mockett Max2/D-94, Satin aluminum finish.
- I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Nickel; match Architect's sample.
- J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- K. Catches: Magnetic.
- L. Drawer Slides:
 - 1. Type: Heavy duty full extension.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Products:
 - a. Accuride International, Inc: www accuride.com.
 - b. Grass America Inc: www.grassusa.com.
 - c. Knappe & Vogt Manufacturing Company: www.knapeandvogt.com.
 - d. Substitutions: See Section 016000 - Product Requirements.
- M. Hinges: European style concealed self-closing type, BHMA No. A156.9, B01602, steel with polished finish.
 - 1. Products:
 - a. Grass America Inc: www.grassusa.com.
 - b. Hardware Resources: www.hardwareresources.com.
 - c. Julius Blum, Inc: www.blum.com.
 - d. Substitutions: See Section 016000 - Product Requirements.
- N. Countertop Supports: Powder coated, formed metal supports. Must provide attachment points between countertop and wall.

2.8 SHOP TREATMENT OF WOOD MATERIALS

- A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.
- B. Provide UL approved identification on fire retardant treated material.
- C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.9 FABRICATION

- A. Cabinet Style: Flush overlay.
- B. Cabinet Doors and Drawer Fronts: Flush overlay.
- C. Drawer Construction Technique: Dovetail joints.
- D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

- F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- H. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.
- I. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.
- J. Fastening devices and their attachment shall be submitted for approval prior to installation. Drywall screws will not be allowed for the attachment and installation of millwork.
- K. Continuous or Unit Tops: All cabinets over 42" and up to 72" in height shall be supplied where shown with a finished 1" continuous top laminated with high pressure decorative laminate and balanced with high pressure backer BKL.
- L. Bases: Provide and install all base and tall units with finished integral base. Provide ¾" thick marine grade plywood bases. All bases shall have finished facings unless rubber vinyl base covering is being furnished and applied by others.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware so center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8" in 96 inch sag, bow or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, bear top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer head screws sized for 1 inch penetration into wood framing, blocking or hanging strips.
- F. Securely anchor countertops by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid surface material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches and clean entire surface.

2. Install countertops with no more than 1/8 inch in 96 inch sag, bow or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 4. Caulk space between backsplash and wall with sealant.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 ADJUSTING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Adjust installed work.
- C. Adjust moving or operating parts to function smoothly and correctly.
- D. Clean woodwork on exposed and semi exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

3.4 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07115 - BITUMINOUS DAMPPROOFING

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 work of this section.

1.2 SUMMARY

- A. This Section includes cold-applied, emulsified-asphalt dampproofing applied to the following surfaces:
 - 1. Exterior face of inner wythe of exterior masonry cavity walls and concrete walls above top of foundation.
 - 2. Exterior, below-grade surfaces of concrete and masonry foundation walls.
 - 3. Back side of concrete and masonry retaining walls, below grade.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
- B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cold-Applied, Emulsified-Asphalt Dampproofing:
 - 2. Euclid Chemical Company (The)
 - 3. Gardner Asphalt Corporation
 - 4. Henry Corporation
 - 5. Koppers Industries, Inc.
 - 6. Malarkey Roofing Company
 - 7. Meadows, W. R., Inc.
 - 8. Sonneborn, Div. Of ChemRex, Inc.
 - 9. Tamms Industries

2.2 BITUMINOUS DAMPPROOFING

- A. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class I.

2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class I, except diluted with water as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturers written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
- B. Apply additional coats if recommended by manufacturer or required to achieve coverage's indicated.
- C. Allow each coat of dampproofing to cure 24 hours before applying subsequent Coats.
- D. Apply dampproofing to top of footings and grade beams where applicable, whether indicated or not.
 - 1. Apply from finished-grade line to top of footing.
 - 2. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 3. Install flashings and corner protection stripping at internal and external corners, changes in plan, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch (200 mm) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.
- E. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.
 - 1. Lap dampproofing at least ¼ inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least ¼ inch (6 mm) onto shelf angles supporting veneer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq.m).
- B. On Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.5 gal. / 100 sq. ft.
- C. On Backs of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than
 - a. gal. /100 sq. ft.

3.5 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION

SECTION 07120 - WATERPROOFING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. Extent of each type of waterproofing work is indicated on drawings.
- B. Types of waterproofing specified in this section include the following:
 - 1. Collector Pipe.
 - 2. Subsurface Drainage Fabric
 - 3. Bentonite Composite Membrane

1.3 QUALITY ASSURANCE

- A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: Firm with not less than 3 years of successful experience in installation of waterproofing similar to requirements for this project and which is acceptable to manufacturer of primary waterproofing materials.

1.4 SUBMITTALS

- A. Product Data: Submit product data and general recommendations from waterproofing materials manufacturer, for types of waterproofing required. Include data substantiating that materials comply with requirements.

1.5 JOB CONDITIONS

- A. Substrate: Proceed with work after substrate construction openings, and penetrating work have been completed.
- B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.6 WARRANTY

- A. Provide 10 year written warranty signed by product manufacturer agreeing to repair or replace the system to a waterproof condition at no cost to the Owner. Warranty shall cover all labor and materials for the full period of warranty.
- B. In addition to above manufacturers' warranty, General Contractor shall provide a 2 year written warranty, agreeing to the same requirements stated for product manufacturer's warranty.

PART 2 - PRODUCTS

1.1 MANUFACTURERS

- A. Manufacturers: The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Collector Pipe: Provide, where indicated:
 - a. Standard Schedule 40, perforated, PVC pipe.

2. Drainage Fabric: Provide, where indicated:
 - a. Layer of subsurface drainage fabric with geotextile filter layer bonded to one side of drainage fabric. Drainage fabric with geotextile filter.
 - b. Manufacturer: J-Drain 100 by JDR Enterprise, Inc., Alpharette, Ga. 30201.
 3. Waterproofing Membrane: Provide, where indicated:
 - a. Composite membrane of Bentonite laminated to sheet high density polyethylene (H.D.P.E.). Composite membrane
 - b. Manufacturer: Paraseal by Paramount Technical Products, Inc., Spearfish, S. D. 57783.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

1.2 MISCELLANEOUS MATERIALS

- A. Adhesives: Provide types of adhesive compound and tapes recommended by waterproofing system manufacturer, for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for sealing of joints between waterproofing and flashings, adjoining surfaces and projections through water- proofing.
- B. Fasteners: Provide type of fasteners recommended by waterproofing system manufacturer.
- C. Flashing Materials: Except as otherwise indicated, provide types of material for flashing as recommended by waterproofing system manufacturer.
- D. Protection Course: Where shown, provide type recommended by waterproofing system manufacturer, unless another type is indicated; include adhesives recommended by manufacturer.

PART 3 - EXECUTION

2.1 PREPARATION

- A. Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work. Review material selections and procedures to be followed in performing work.

2.2 INSTALLATION

- A. Comply with manufacturer's instructions for handling and installation of waterproofing materials.
- B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of waterproofing materials.
- C. Extend waterproofing system and flashings as shown over area indicated to be waterproofed. Seal to projections through waterproofing and seal seams. Fasten to vertical surfaces and also, where shown or recommended by manufacturer to horizontal surfaces.

2.3 PERFORMANCE REQUIREMENTS

- A. It is required that waterproof systems are watertight and not deteriorate in excess of limitations published by manufacturer.

2.4 PROTECTION

- A. Institute required procedures for protection of completed system during installation of other work and throughout remainder of construction period.

END OF SECTION

SECTION 07141 – INTERIOR MASONRY WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Waterproofing below grade exterior surface of concrete, cement or concrete block brick, or stone basements, and foundation walls as scheduled.
2. Waterproofing above grade exterior surfaces of concrete, cement, brick, stone or concrete block walls, ceilings or floors as scheduled.
3. Waterproofing below grade interior surface of concrete, cement, brick, stone or concrete block basements and foundation walls as scheduled.
4. Waterproofing above grade interior surfaces of concrete, cement, brick, stone or concrete block walls, ceilings or floors as scheduled.
5. Waterproofing above or below grade non-potable water tanks, pools, lagoons, ponds, fountains or water features as scheduled.

- A. Related Sections:

1. Section 03 30 00 – Cast-in-Place Concrete.
2. Section 03 41 00 – Precast Structural Concrete.
3. Section 03 47 13 – Tilt-Up Concrete.
4. Section 04 21 00 – Masonry Assemblies Unit Masonry.
5. Section 04 22 00 – Concrete Unit Masonry

1.3 REFERENCES

- A. ASTM International (ASTM)

1. ASTM D 16 – Standard Terminology for Paint, Related Coatings, Materials and Applications. ASTM D 1653 Method A (Dry Cup) – Standard Test Methods for Water Vapor Transmission of Organic Coating Films.
2. ASTM D 6904 – Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied to Masonry.
3. ASTM D 7088 – Standard Practice for Resistance to Hydrostatic Pressure for Coatings Used in Below Grade Applications Applied to Masonry.

1.4 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: For each type of product.
 1. Include construction details, materials descriptions and tested physical properties of water proofing.
 2. Include manufacturer's instructions for evaluating, preparing and treating substrate.
- C. Shop Drawings:
 3. Show locations and extent of waterproofing.
- D. Samples:

4. For each product specified, two samples, minimum 4 inches square, representing actual product color and texture.

1.5 QUALITY ASSURANCE

- A. Comply with Section 01 40 00.
- A. Qualifications:
 1. Manufacturer Qualifications: Company with minimum 15 years of experience in manufacturing of specified products and systems.
 2. Applicator Qualifications: Company with minimum of 5 years' experience in application of waterproofing as specified in this section on projects of similar size and scope, and employs installers and supervisors who are trained by and acceptable to product manufacturer.
 - a. Successful completion of a minimum of 5 projects of similar size and complexity to specified Work.
- B. Field Mock-up:
 1. Install at Project site or pre-selected area of building an area for field mock-up, as directed by Architect.
 2. Apply material in strict accordance with manufacturer's written application instructions.
 3. Manufacturer's representative or designated representative will review technical aspects; surface preparation, application, and workmanship.
 4. Field sample will be standard for judging workmanship on remainder of Project.
 5. Maintain field mock-up during construction for workmanship comparison.
 6. Do not alter, move, or destroy field mock-up until Work is completed and approved by Architect.
 7. Obtain Architect's written approval of field mock-up before start of material application, including approval of aesthetics, color, texture, and appearance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 60 00.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Transport and store in unopened containers and keep in clean, dry condition protected from rain, dew, and humidity.
- E. Do not allow DRYLOK® to freeze.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Do not apply in rain or when rain is expected within 24 hours. Do not apply above 90 degrees F (32 degrees C) or below 50 degrees F (10 degrees C) or when temperatures are expected to fall below 40 degrees F (4 degrees C) within 24 hours.

1.1 WARRANTY

- A. Manufacturer agrees to replace product or refund product purchase price if product fails to provide a waterproof coating.
 1. Warranty Period: 15 years from application.
 2. Specific Warranty Limitations:
 - a. Review manufacturer website: <http://www.drylok.com/warranty/ugl-drylok-extreme-masonry-waterproofer-15-year-warranty.pdf> for complete warranty details.

3. Warranty Inspection: Manufacturer representative or designated representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products from the following manufacturer:
 1. United Gilsonite Laboratories (UGL), which is located at 1396 Jefferson Avenue, P.O. Box 70 Scranton, PA 18501; Customer Service: 1-800-845-5227 or 1-570-344-1202; Email: ugllabs@ugl.com; Website: www.ugl.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. DRYLOK® EXTREME Latex Base Masonry Waterproofer - Latex based coating for concrete and masonry that resists both positive and negative hydrostatic pressure.

2.3 MIXING

- A. Stir thoroughly before and during application. Do not thin.
- B. Color:
 1. White
 2. Custom color. Refer to Drawings.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Comply with Section 01700.

3.2 SURFACE PREPARATION

- A. Ensure that substrates are sound and free of dust, dirt, paints, form oils, wax curing compounds, or other contaminants that could impair bond of the coating. Old paint in poor condition must be removed by wire-brushing, sand blasting or other suitable means.
- B. Ensure substrate has properly cured. Concrete should obtain 80 percent of design strength. If efflorescence is present, remove it with DRYLOK® ETCH or muriatic acid before proceeding.

3.3 APPLICATION – GENERAL

- A. Stir DRYLOK® EXTREME thoroughly during application.
- B. Apply coating directly on to bare masonry with a DRYLOK® Brush, nylon bristle brush or equivalent stiff fiber brush or by textured spray equipment. Spray or back-brush first coat to fill pores of masonry and achieve uniformity.
- C. Two coats shall be applied. Allow first coat to cure 3 hours, then apply second coat by brush, spray or roller.
- D. Examine finished surface after two coats and inspect for any leaking, open pores or pinholes. If observed, spot-treat rejected areas, repaint entire surface with another coat of DRYLOK® EXTREME and reinspect.
- E. Allow coating to cure 7 to 10 days before immersion in water.

3.4 CLEANING

- A. Clean waterproofing material from tools and equipment with water. Remove cured materials by washing or scraping.

3.5 PROTECTION

- A. Protect work from damage of other trades during construction. Correct deficiencies or damage by cleaning or recoating, as approved by Architect.

END OF SECTION

SECTION 07200 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections shall apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 - 1. Blanket-type at all exterior stud walls.
 - 2. Blanket type building above new ceiling.
 - 3. Cavity Wall Insulation.
 - 4. Metal Building Roof and Wall Insulation

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

1.4 PRODUCT HANDLING

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.1 BATT INSULATION

A. MANUFACTURERS:

- 1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Certain-Teed Products Corp.; Valley Forge, PA
 - b. Manville Bldg. Materials Corp.; Denver, CO.
 - c. Owens-Corning Fiberglass Corp.; Toledo, OH.
- 2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

- 1. Mineral/Glass Fiber Blanket/Batt Insulation (M/GFB-Ins): Inorganic (nonasbestos) fibers formed into resilient flexible blankets or semi-rigid batts; FS HH-1-521. Manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated.
- 2. Exterior Walls: Provide foil faced (FSK ASTM 84 – non-flammable) batts at all exterior walls that will have no interior wall covering applied.
 - a. Thickness: 6" Batt's will have a minimum R19
- 3. Exterior Walls: Provide un-faced batts at all exterior wall applications that receive interior wall coverings (ie: sheetrock, plywood, etc.).
 - a. Thickness: 6" Batt's will have a minimum R19
- 4. Interior Stud Walls: Provide unfaced Sound Attenuation batts at interior stud partitions.

- a. Thickness: 3 ½" (nominal), unfaced batts.
5. Above Ceilings: Provide un-faced batts at exposed framed roof areas between the trusses at the bottom cord or joists that will receive interior coverings at the bottom of the system (ie: sheetrock, plywood, concrete, etc.).
 - a. Thickness: R-Factor: 30 (minimum) as follows:

2.2 CAVITY WALL INSULATION

A. MANUFACTURERS:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Styrofoam SM/SB; Dow Chemical USA.
 - b. Foamular 250; UC Industries.
 - c. Certifoam, Minnesota Diversified Products, Inc.
2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

1. Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the exposition of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV; 5-year aged
2. All Cavity Walls: Provide rigid thermal insulation at the cavity space.
 - a. R-value of 5.0 Btu/ (hr x sf x degree F) at 75 degree F in manufacturer's standard lengths and widths
 - b. 1" thick, unless otherwise indicated.
3. Adhesive:
 - a. Type recommended by insulation board manufacturer for application indicated.

2.3 METAL BUILDING ROOF AND WALL INSULATION – SIMPLE SAVER SYSTEM

A. MANUFACTURERS:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Thermal Design, Inc., Simple Saver System, Madison, NE
2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. References:

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure B).
3. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
4. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
5. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
6. ASTM C 1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

C. Design Requirements:

1. Insulating system shall have a continuous vapor barrier inside of building purlins, girts, and insulation to provide complete isolation from inside conditioned air.

D. MATERIALS:

1. Simple Saver System consists of Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components in a insulation system.
2. Batt Insulation: ASTM C 991 Type 1; preformed formaldehyde-free glass fiber batt conforming to the following:
 - a. Equal to purlin/girt spacing by manufacturer's standard lengths.
 - b. Unfaced.
3. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:
 - a. Upper Layer: **R-11**; 3-1/2 inches (89 mm)
 - b. Bottom Layer: **R-19**; 6 inches (152 mm).
 - c. U Factor 0.035 (**R30**) installed.
4. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as follows:
 - a. **R-25**, U Factor U-0.040.
5. Vapor Barrier Liner Fabric: Syseal® type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:
 - a. Product complies with ASTM C 1136, Types I through Type VI.
 - b. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
 - c. Flame/Smoke Properties: 1) 25/50 in accordance with ASTM E 84. 2) Self-extinguishes with field test using matches or butane lighter.
 - d. Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
 - e. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - f. Provide with factory double, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
 - g. Factory-folded to allow for rapid installation.
 - h. Color: To be selected by Architect after bid date from manufactures standards.
6. Vapor Barrier Lap Sealant:
 - a. Solvent-based, Simple Saver polyethylene fabric adhesive.
7. Vapor Barrier Tape:
 - a. Double-sided sealant tape 3/4 inch (19 mm) wide by 1/32 inch (.79 mm) thick.
8. Vapor Barrier Patch Tape:
 - a. Single-sided, adhesive backed sealant tape 3 inches (76 mm) wide made from same material as Syseal® type liner fabric.
9. Thermal Breaks:
 - a. Provide thermal blocks/breaks at all roof to purlin connections points.
 - b. 1/8 inch (3 mm) thick by 3 inch (76 mm) wide white, closed-cell polyethylene

- c. foam with pre-applied adhesive film and peel-off backing.
 - d. Polystyrene Snap-R snap-on thermal blocks.
10. Straps:
- a. 100 KSI minimum yield tempered, high-tensile-strength steel.
 - b. Size: Not less than 0.020 inch (0.50 mm) thick by 1 inch (25 mm) by continuous length.
 - c. Galvanized, primed, and painted to match specified finish color on the exposed side.
 - d. Color: As selected from manufactures standards
11. Primed and painted to match specified finish color on the exposed side.
12. High-tensile-strength stainless steel.
- a. Woven polyester plastic. As selected from manufactures standards
13. Fasteners:
- a. For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
 - b. For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
 - c. For wood, concrete, other materials: As recommended by manufacturer.
14. Wall Insulation Hangers:
- a. Fast-R preformed rigid hangers, 32 inch (813 mm) long galvanized steel strips with barbed arrows every 8 inches (203 mm) along its length.

E. INSTALLATION:

1. General:
- a. Install pre-engineered building insulation system in accordance with manufacturer's installation instructions and the approved shop drawings.
 - b. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
 - c. Install in exterior spaces without gaps or voids. Do not compress insulation.
 - d. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
 - e. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.
2. Roof Insulation Installation:
- a. Straps:
 - i. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
 - ii. Tension straps to required value.
 - b. Vapor Barrier Fabric:

Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.

 - i. Position pre-folded fabric on the strap platform along one eave purlin.
 - ii. Clamp the two bottom corners at the eave and also centered on the bay.
 - iii. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.

- iv. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
 - v. Trim edges and seal along the rafters.
 - vi. All seams must be completely sealed and stapled seams not acceptable.
- c. Insulation:
- i. Unpack, and shake to a thickness exceeding the specified thickness.
 - ii. Ensure that cavities are filled completely with insulation.
 - iii. Place on the vapor barrier liner fabric without voids or gaps.
 - iv. Place top layer of insulation over and perpendicular to the purlins without voids or gaps, as roof sheathing is applied.
 - v. Place thermal block on top of purlins or bottom of purlins for retrofit work if no other thermal break exists.
 - vi. Place new insulation between purlins at the required thickness for the R-value specified.
- d. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.
3. Wall Insulation Installation:
- a. Install thermal break to exterior surface of girts as wall sheathing is applied.
 - b. Install self-sticking foam thermal break to interior surface of girts prior to installation of insulation.
 - c. Position and secure Fast-R hangers to girts on the inside face of the wall sheathing.
 - d. Cut insulation to required lengths to fit vertically between girts.
 - e. Fluff the insulation to the full-specified thickness.
 - f. Neatly position in place and secure to Fast-R hangers.
 - g. Ensure that cavities are filled completely with insulation.
4. Vapor Barrier Fabric:
- a. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - b. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.
 - c. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
 - d. All seams must be completely sealed and stapled seams not acceptable.
5. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Installer must examine substrates and conditions under which insulation work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

- B. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.
- C. Close off openings in cavities to receive poured-in-place and insulation, sufficiently to prevent escape of insulation. Provide bronze or stainless steel screen (inside) where openings must be maintained for drainage or ventilation.

3.2 INSTALLATION

- A. General: Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

3.3 CAVITY WALL INSULATION

- A. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside face. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill all cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.4 PROTECTION

- A. General: Protect installed insulation and vapor barriers from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

END OF SECTION

07260 – UNDER SLAB VAPOR BARRIER (Gymnasium Foundation)

PART 1 – GENERAL

1.1 SUMMARY

- A. Products supplied under this section:
 - 1. Vapor barrier and installation accessories for installation under concrete slabs.
- B. Related sections:
 - 1. Section 03 30 00 Cast-in-Place Concrete
 - 2. Section 07 26 00 Vapor Retarders

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E1745-17: Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - 2. ASTM E1643-18a: Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. Technical Reference - American Concrete Institute (ACI):
 - 1. ACI 302.2R-06: Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
 - 2. ACI 302.1R-15: Guide to Concrete Floor and Slab Construction.

1.3 SUBMITTALS

- A. Quality control/assurance:
 - 1. Summary of test results per paragraph 9.3 of ASTM E1745.
 - 2. Manufacturer's samples and literature.
 - 3. Manufacturer's installation instructions for placement, seaming, penetration prevention and repair, and perimeter seal per ASTM E1643.
 - 4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.
 - 5. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.
 - 6. Vapor barrier manufacturer must warrant in writing (a) compliance with the designated ASTM E1745 classification, and (b) no manufacturing defects in the product for, at least, the Life of the Building.
 - 7. Manufacturer verify in writing 20 years in the industry with no reported product failures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Vapor barrier shall have all the following qualities:
 - 1. Maintain permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
 - 2. Other performance criteria:
 - a. Strength: ASTM E1745 Class A.
 - b. Thickness: 15 mils minimum
 - 3. Provide third party documentation that all testing was performed on a single production roll

per ASTM E1745 Section 8.1

- B. Vapor barrier products:
 - 1. Basis of Design: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.
 - 2. Vaporguard by Reef Industries, 713-507-4250. www.reefindustries.com .
Moistop Ultra 15 by Fortifiber 1-800-773-4777 www.buildsite.com.

2.2 ACCESSORIES

- A. Seams:
 - 1. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- B. Sealing Penetrations of Vapor barrier:
 - 1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
 - 2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- C. Perimeter/terminated edge seal:
 - 1. Stego Crete Claw (textured tape) by Stego Industries LLC,
 - 2. Stego Term Bar by Stego Industries LLC, (877) 464-834; www.stegoindustries.com.
 - 3. StegoTack Tape (double-sided sealant tape) by Stego Industries LLC, (877) 464-834 www.stegoindustries.com.
 - 4. One-sided seaming tape is not a recommended method of sealing at the terminated edge.
- D. Penetration Prevention:
 - 1. Beast Foot by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- E. Vapor Barrier-Safe Hand Screed System
 - 1. Beast Screed by Stego Industries, LLC, (877) 464-7834 www.stegoindustries.com.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
 - 1. Level and compact base material.
- B. Contact vapor barrier manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.

3.2 INSTALLATION

- A. Install vapor barrier in accordance ASTM E1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
 - 2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, water stops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself. **Note: The perimeter seal can be handled several ways. When sealing to the slab, textured tape is the best option. When sealing to a stem wall or wall, the best option is to use double-sided tape or both double-sided tape and a termination bar.**

- a. Seal vapor barrier to the entire slab perimeter using manufacturer's textured tape with a surface that creates a mechanical seal to freshly-placed concrete, per manufacturer's instructions.

OR

- b. Seal vapor barrier to the entire perimeter wall or footing/grade beam with manufacturer's double-sided tape, or both termination bar and double-sided tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
3. Overlap joints 6 inches and seal with manufacturer's seam tape.
4. Apply seam tape/textured tape/double-sided tape to a clean and dry vapor barrier.
5. Seal all penetrations (including pipes) per manufacturer's instructions.
6. Avoid the use of stakes driven through vapor barrier by utilizing screed and forming systems that will not leave punctures in the vapor barrier.
7. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

END OF SECTION

SECTION 07410 - PREFORMED METAL ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The work under this section consists of all preformed metal roofing, underlayment, ridge vent system, sheet metal, roof drainage accessories and all related items necessary to complete the roofing system work indicated on the drawings and herein specified including but not limited to the following:
 1. Formed Roof Panels for Standing Seam Installation
 2. Underlayment.
 3. Workmanship
 4. Inspection of Surfaces
 5. Protection
 6. Delivery, Samples and Shop Drawings

1.3 QUALITY ASSURANCE

- A. The Contractor shall engage the services of a Professional Roof Consultant. The Consultant must hold a minimum title of Registered Roof Observer (RRO) through the International Institute of Building Enclosure Consultants (IIBEC) and provide evidence of adequate insurance as required below. The Consultant should perform three (3) inspections during the installation of each new roof system type (1 – Start up inspection; 2 – Interim inspection; 3 – Final inspection). The Consultant must document all site visits with photographs and written reports. All reports shall be forwarded to the Architect with documentation of the roofing progress and any deficiencies noted during the inspections. Upon completion of all punch list items, the Consultant should provide a letter of roof completion advising the new roof systems meet and/or exceed the project requirements. ***(Note: Although the contractor will be paying the roof consultant from their proceeds, the roof consultant will be considered an agent of the owner and architect throughout the project and will perform the required inspections on behalf of the owner and architect. The above specification shall be applied to individual facilities when multiple site locations are included in the project.)***
 1. Roof Consultant Insurance Requirements:
 - a. Gen. Liability - \$1,000,000 each occurrence - \$2,000,000 General Aggregate / Auto. Liability - \$1,000,000 / Umbrella Liability. - \$1,000,000 / Workers Compensation - \$1,000,000 per statute / Professional Liability - \$1,000,000
 2. Approved Roof Consulting Firm:
 - a. Roof Asset Management, Inc. | David Lee, RRO, CIT, FAA-107 | 4950 Woodfield Drive, Millbrook, Alabama 36054 | (334) 590-7999.
 - b. Substitutions: Roof consulting firms must be pre-approved by the Architect. Requests for a substituting firm must be submitted "In writing" 10 (Ten) days prior to the bid opening.
- B. Performance Test Standards: Provide preformed panel systems which have been pretested and certified by manufacturer to provide specified resistance to air and water infiltration and structural deflection and failure when installed as indicated and when tested in accordance with AAMA 501, "Methods of Test for Metal Curtain Walls".
- C. Field Measurements: Where possible, prior to fabrication of prefabricated panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units

where final dimensions cannot be established prior to fabrication.

- D. Impact Resistance: Roof coverings installed on low-slope roofs (roof slope <2:12) shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test "FM 4470.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, standard details, certified product test results, installation instructions and general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.
- B. Samples: Submit 2 samples 12" square, of each exposed finish material.
- C. Shop Drawings: Submit small-scale layouts of panels on roofs, and large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory and field assembly work.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed.
- B. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials which might cause staining.

1.6 ROOFER'S QUALIFICATIONS

- A. Installation of the metal roofing and roof related accessories shall be performed by **Certified / Preferred Roofers** authorized by the manufacturer as trained and qualified to erect the manufacturer's product.
- B. The Contractor shall submit a letter from the manufacturer of the metal roofing system, certifying the date of certification from the Manufacturer and the dates and year the Roofing Contractor attended school, prior to full certification that this Roofing Contractor is a certified roofer.

1.7 ROOFING WARRANTIES & GUARANTEE

- A. Weather Tightness Warranty
 - 1. The entire installation (sub-framing, clips, panels, fasteners, rakes, eave, ridge, valley flashing conditions, roof to wall conditions as-well-as all materials specified as supplied by the manufacturer) shall be guaranteed weather tight for a minimum of **Twenty (20) years (NO Dollar Limit NDL)**. Provide written warranty, signed by metal roofing manufacturer and his authorized installer, agreeing to replace/repair defective materials and workmanship during the warranty period, certified by the third-party inspection firm as stated under QUALITY ASSURANCE. This warranty shall be identified as neither Non-Depreciating, Non-Pro-Rated, nor have exclusions that identify, valleys, curbs, and flashings. The warranty shall be signed by the Manufacture of the roofing materials and the authorized installer.
 - 2. Compatibility: Provide products which are recommended by manufacturers to be fully compatible with indicated substrates or provide separation materials as required to eliminate contact between incompatible materials.
- B. Manufacturer's Warranty
 - 1. **Manufacturer's roofing warranties which contain language regarding the governing of the warranty 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 warranties.**
 - 2. Roof Panels: Durability of the metallic coated and unpainted roof panels due to rupture, structural failure or perforation shall be warranted for a period of **Twenty (20) years** by the manufacturer.

3. Color Finish:
 - a. The exterior color finish for painted panels shall be warranted by the Manufacturer for **Twenty-five (25) years** against blistering, peeling, cracking, flaking, chalking and shipping.
 - b. Excessive color change and chalking shall be warranted for **Twenty-five (25) years**.
 - i. Color change shall not exceed 5 NBS units per ASTM D2244.68T, chalking shall not be less than a rating of 6 (white) or 8 (other colors) per ASTM D-659.
 4. The roofing manufacture shall be required to provide documentation certifying that the roof design provided complies with the performance requirements as set forth in IBC Chapter 15, Section 1504. The documentation shall be attached to the roof warranty at the close out of the project.
- C. Contractor's Roofing Guarantee
1. Contractor shall furnish Contractors 5 Year Alabama Division of Construction Management Roofing Guarantee. This roofing guarantee is included in the front end documentation of this project manual.
- D. All roof warranties/guarantees shall be provided to the Owner, by the Contractor at the Final Inspection to obtain the Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
1. American Buildings Company/A Nucor Company; (**Basis of Design and Quality**); www.americanbuildings.com; 1150 State Docks Road, Eufaula, Alabama 36027; Phone: 334.687.2032.
 2. Butler Manufacturing; www.butlermfg.com; 1540 Genessee St., Kansas City, MO. 64102; Phone: 816.968.3000
 3. MBCI Manufacturing; www.mbc.com; 2280 Monier Avenue, Lithia Springs, Georgia, 30122; Phone: 844.2506 or 770.729.4772.
 4. Varco Pruden; www.vp.com; 3200 Players Club Circle, Memphis, TN 38125; Phone: 1.901.748.8000
 5. Morin / A Kingspan Group Company; www.kingspan.com/us/en-us/product-groups/metal-roof-wall-systems; 1975 Eidson Drive, Florida, 32724; Phone: 860.584.0900 or 800.640.9501
 6. ACI Building Systems, LLC.; www.acibuildingsystems.com; 10125 Highway 6 West, Batesville, MS 38606; Phone: 662.563.4574.
 7. AllSouth Pre-Engineered Components, LLC.; 985 Technology Drive, Dothan, Alabama, 36303; Phone: 334.699.8394; www.buildwithapec.com.
 8. Berridge Manufacturing Company; www.berridge.com; 319 Lee Industrial Boulevard, Austell, Georgia; Ph: 770.941.5141.

2.2 MATERIALS

- A. All materials shall be from a single source.
- B. Loc-Seam 360 with Kynar 500 Finish by American Buildings Company/A Nucor Company.
1. Standing seam roof panel shall have a configuration consisting of 2 inch high vertical rib spaced on 16 inch centers. The panel shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations which create voids requiring supple metal closure devices shall not be considered acceptable. Panels shall be joined at the sidelap with an interlocking seam mechanically locked by a seaming machine after

installation. The female panel seam shall have a factory applied sealant, in compliance with UL90.

2. The panel shall be **24 gauge (minimum)** commercially pure aluminum coated steel meeting military specification MIL-C-4174A Type II, Galvalume or G90 galvanized. Minimum yield strength shall be 80,000 PSI.
3. Deviations in appearance from the quality standard manufacturer's panel must be approved by the owner before acceptance.
4. Changes in framing or variations in loading to the existing structure caused by alternate roof systems shall be subject to review and all costs for any modifications shall be the responsibility of the General Contractor.
5. System Description: The roof system is a concealed fastener interlocking standing seam system. ***Panel must not be roll formed on site, nor use a portable roll former whereby the contractor manufactures the panel versus a single sourced manufacture providing the finished materials with a single sourced warranty.***
6. Roof panels shall be standing seam interlocking design and secured to the supports with a concealed structural fastening system. UL certification must appear on the panel if so requested.
7. The concealed attachment system shall eliminate all through penetration of the exposed roofing surface into structural supports and allow the roof covering to move independently of any differential thermal movement by the framing system.
8. The panel to structural clip shall be designed to provide +/- one inch of thermal movement. It shall incorporate a self centered feature to assure one inch of movement in both directions.
9. The standing seam shall have integral male and female interlocking ribs with a factory applied, non-hardening sealant, and the seams shall be continuously locked or crimped together by mechanical means during installation.
10. Roof panels shall be fastened to the support framing members with a concealed clip or backing device of steel having a protective metallic coating. Through penetration of the roofing surface by exposed fasteners shall occur only for non-structural connection at panel termination and roof perimeter flashing location.
11. Panel termination and perimeter flashing (attached to roof panels) shall be sealed with sealants recommended by the manufacturer.
12. Required closures shall be metal. Non-metal closures shall not be acceptable.
13. Provide thermal blocks at all roof to purlin connection points/deck supports.

2.3 METAL FINISHES

- A. General: Apply coating either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover and retain until installation has been completed.
- B. Color Finish on Roof Panels and Trim:
 1. Panels shall have a factory color finish on the exposed side. The exposed finish shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning.
 2. Color of the exterior roof panels and trim shall be selected from manufactures standard color pallet.
 3. The exterior color finish shall meet or exceed the performance requirements specified below.
 - a. Paint Color Test:

- i. Test: Film Thickness; Test Method: ASTM D-1005; Performance: 0.2 mil primer 0.8-0.9 mil topcoat
- ii. Test: 60° @ under 10 low gloss; Test Method: ASTM D-523; Performance: 25-35
- iii. Test: IR Reflectivity; Test Method: ASTM D-4803-97; Performance: Must meet 25% Minimum (exceeds)
- iv. Test: Pencil Hardness; Test Method: ASTM D-3363; Performance: HB-H
- v. Test: Flexibility, T-Bend; Test Method: ASTM D-4145; Performance: 2-T Galvalume Steel
- vi. Test: Adhesion; Test Method: ASTM D-3359; Performance: No adhesion Loss
- vii. Test: Reverse Impact; Test Method: ASTM D-2794; Performance: No cracking or loss of adhesion
- viii. Test: Abrasion, Falling Sand; Test Method: ASTM D-968; Performance: 65-85 1/mil
- ix. Test: Mortar Resistance; Test Method: ASTM C-267; Performance: No effect
- x. Test: Detergent Resistance; Test Method: ASTM D-2248 3% 72 hrs. @ 100°F; Performance: No effect
- xi. Test: Acid Pollutants; Test Method: ASTM D-1308 10% Muriatic Acid (15 min) 20% Muriatic Acid (15 min); Performance: No effect, AAMA 605.2 <5units color change
- xii. Test: Acid Rain Test; Test Method: Kesternich; Performance: 15 cycles minimum, no objectionable color change
- xiii. Test: Alkali Resistance; Test Method: 20% Sodium Hydroxide (1hr); Performance: No effect
- xiv. Test: Salt Spray Resistance 5% @ 95° F; Test Method: ASTM B-117; Performance: 1000 hrs Galvalume steel
- xv. Test: Humidity Resistance 100% @ 100° F; Test Method: ASTM D-2247; Performance: Passes 1000 hrs Galvalume Steel
- xvi. Test: South Florida exposure; Test Method: ASTM D-2244; Performance: <5 units color change
- xvii. Test: UVB (313 bulbs); Test Method: ASTM G-53; Performance: Passes 3000 hrs
- xviii. Test: Chalk Resistance; Test Method: ASTM D-4214; Performance: Rating of 8 min

4. Colors must meet the following: The solar reflectance for a steep-sloped roof must be a minimum of 25%, dropping no less than to 15% after three years. Low sloped roofs (below 2:12) must be a minimum of 65% dropping to no less than 50% after three years.

2.4 ROOF PANELS

- A. General: Provide roofing sheets formed to the general profile or configuration indicated. All roof panels shall be full length, no end laps allowed.
- B. Zinc-Coated Steel Sheets: Provide structural quality hot-dip galvanized steel sheets, complying with requirements of ASTM A446, Grade C, with G90 coating complying with ASTM A525.
- C. Aluminum Coated Steel Sheets: Provide drawing quality aluminum coated steel sheets, complying with requirements of ASTM A463, with T1-40 coating.
 - 1. Metal thickness not less than 24 ga. (0.0179").
- D. Accessories: Provide the following sheet metal accessories factory formed of the same material and finish as the roofing and siding.

1. Flashings.
 2. Fillers.
 3. Metal expansion joints.
 4. Facias
 5. Ridge covers.
 6. Cover exposed structural and secondary members at exterior.
- E. Fasteners:
1. Provide self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end welded studs, and other suitable fasteners as standard with the manufacturer designed to withstand design loads.
 2. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
 3. Use stainless steel fasteners for exterior application and galvanized or cadmium plated fasteners for interior applications.
 4. Locate and space fastenings in true vertical and horizontal alignment. Use proper type fastening tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
 5. Provide fasteners with heads matching color of roofing sheets by means of plastic caps or factory-applied coating.
- F. Flexible Closure Strips: Provide closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips. Cut or premold closure strips to match corrugation configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.
- G. Sealing Tape: Provide pressure sensitive 100 percent solids isobutylene tripolymer compound sealing tape with release paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape not less than 1/2" wide and 1/8" thick.
- H. Joint Sealants: Provide one-part elastomeric polyurethane polysulfide or silicone rubber sealant as recommended by the building manufacturer.

2.5 UNDERLAYMENTS

- A. Synthetic Underlayment:
1. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. SDP Advanced Polymer Products
 - b. GAF
 - c. Tamko
 - d. ELK
 - e. Certainteed
 2. Materials:
 - a. One layer of a Class A synthetic flame retardant underlayment.
 - b. Palisade Synthetic Underlayment; SDP Advanced Polymer Products
 - Tensile Strength – ASTM D226 – 150lbs
 - i. Tear Strength – ASTM D4533 – 50lbs
 - ii. Puncture Strength – ASTM D751 – 300 psi
 - iii. UV Rating – ASTM G90 – 90%

- iv. Permeability – ASTM 96-A – 0.10 Perms
- v. Thickness – ASTM D5147 – 25 mills
- vi. Weight per Square – ASTM D5261 – 4 lbs.
- vii. Install with roofing nails – no staples will be allowed.

B. Self-Adhered Underlayment:

1. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - a. SDP Advanced Polymer Products
 - b. Carlisle Dri-Start A
 - c. Tamko Moisture Guard
2. Materials:
 - a. At all Valleys, Ridges, Hips and Eaves install 40 mil self- adhering ice and water shield membrane.
 - b. Palisade SA-HT; SDP Advanced Polymer Products
 - i. Color - KOOL BLUE™
 - ii. Top Surface - STRONGHOLD™ Anti-Skid Technology: Polymer
 - iii. Bottom Release Liner - Silicone Split Release Poly
 - iv. Permeability - ASTM E96 - 00 0.01 perms
 - v. Nominal Thickness - ASTM D1777 - 40 mil (1 mm)
 - vi. Nail Sealability - ASTM D1970 - Pass
 - vii. Lap Sealability - ASTM D1970 - Pass
 - viii. Tensile Strength - ASTM D226 - 121 lbf/in. (21kN/m)
 - ix. Tear Strength - ASTM D4523 - 160 lbf/in. (28 kN/m)
 - x. Elongation - ASTM D2523-00 - 16%
 - xi. Low Temperature Flexibility - ASTM D1970 - -22 F (-30 C) - Pass
 - xii. Adhesion to Plywood - ASTM D1876 - 55 lbf/in.:75 F (9.6 kN/m: 24 C)
 - xiii. Adhesion to Plywood - ASTM D1876 - 23 lbf/in.: 40 F (4 kN/m: 4.4 C)
 - xiv. UV Exposure - ASTM G90 - 6 months
 - xv. Temperature Range - ASTM D1970 - LT: 15 F (-9 C) to HT: 250 F (121 C)
 - xvi. Dimensions - 36 in. x 66.7 ft. (91.4 cm x 20.3 m)

2.6 MISCELLANEOUS MATERIALS

- A. Internal Panel Framing: Manufacturer's standard.
- B. Fasteners: Manufacturer's standard noncorrosive types, with exterior heads gasketed.
- C. Accessories: Except as indicated as work of another specification section, provide components required for a complete roofing/siding system, including:
 1. Trim
 2. Copings
 3. Fascias
 4. Gravel stops
 5. Mullions

6. Sills
 7. Corner Units
 8. Ridge Closures
 9. Clips
 10. Seam Covers
 11. Battens
 12. Flashings
 13. Gutters
 14. Downspouts
 15. Louvers
 16. Sealants
 17. Gaskets
 18. Fillers
 19. Closure Strips
 20. All similar items.
 21. Match materials/finishes of preformed panels.
- D. Bituminous Coating: Cold-applied asphalt mastic, SSPC paint 12, compounded for 15 mil dry film thickness per coat.

2.7 SHEET METAL ACCESSORIES

- A. General: Provide coated steel sheet metal accessories with coated steel roofing and siding panels.
- B. Gauges of Materials:
 1. Roof Panels - 24 ga.
 2. Rake Flashing - 26 ga.
 3. Fascia – 26 ga.
- C. Roof Curbs: The fully welded roof curb units shall be fabricated to the specifications of the roofing manufacturer, thus assuring its compatibility with the roof constructions framing and covering. Roof curbs shall be of size and design to accommodate the various projecting elements to be retained. The contractor is responsible for verification of the various sizes, configurations, and requirements. It is expected that the contractor use the existing conditions, surfaces, and elements as a source material for these requirements. The roof curb shall be of size and design required for fan, vent or air conditioning equipment. It shall support the specific ventilating device in a nominally horizontal position above the weather surface of the roof and adequately deflect storm drainage around its periphery. All sealants, closures and fasteners, etc. shall be included for proper installation and performance. Roof subframing and/or headers shall be provided for additional rigidity and support of the curb and its ventilating device. Roof vent curb and supporting framing shall provide for expected expansion and contraction of roof panels.
- D. Roof Jacks: Openings 8" in diameter or smaller may be flashed and sealed to the roof panel by jacks. Material shall be an EPDM material with an aluminum sealing ring base. Jacks are acceptable providing attachment in flat of panel and no standing seam rib has been altered. If rib must be cut, a curb must be used. Installation of roof jacks must comply with manufacturer's instructions.

PART 3 - EXECUTION

3.1 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, 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. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.
- B. The pre-roofing conference is intended to clarify demolition and application requirements for work to be completed before roofing operations can begin. 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. To review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
 - 2. To establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
 - 3. To 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. To establish those areas on the job site that will be designated as work and storage areas for roofing operations.
 - 6. To establish weather and working temperature conditions to which all parties must agree.
 - 7. To 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 Division of Construction Management, and the Division of Construction Management Inspector.

3.2 INSTALLATION

- A. General: Comply with panel fabricator's and material manufacturer's instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the work securely in place, with provisions for thermal/structural movement.
 - 1. Install panels with concealed fasteners.
- B. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4" in 20'-0" on level/plumb/slope and location/line as indicated, and within 1/8" offset of adjoining faces and of alignment of matching profiles.
- C. Joint Sealers: Install gaskets, joint fillers and sealants where indicated and where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.
- D. Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.

- E. Water shall be prevented from entering the building during the work. This shall involve keeping penetrations sealed, planning the work to reroof sections and sealing new to old or other precautionary and effective safeguards.

3.3 ROOFING

- A. General: Arrange and nest sidelap joints so that prevailing winds blow over, not into, lapped joints. Apply panels and associated items for neat and weathertight enclosure. Avoid “panel creep” or application not true to line. Protect factory finishes from damage.
 - 1. Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with rubber, neoprene or other closures to exclude weather.
- B. Standing Seam Roof Panel System: Fasten roof panels to hat channels with concealed clip in accordance with the manufacturer’s instructions.
 - 1. Install clips at each support using self-drilling fasteners.
 - 2. At end laps of panels install two strips of tape caulk between panels.
 - 3. Install factory-caulked cleats at standing seam joints. Machine seam cleats to the panels to provide a weather-tight joint.
- C. Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories in accordance with manufacturer’s recommendations for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

3.4 CLEANING AND PROTECTION

- A. Damaged Units: Replace panels and other components of the work which have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films (if any) as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

SECTION 07421 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Flush-profile, concealed fastener metal wall panels, with related metal trim, and accessories.
 - 1. Interior Wall Panels.
 - 2. Exterior Wall Panels.

1.2 RELATED REQUIREMENTS

- A. Division 05 Section "Structural Steel Framing" for steel framing supporting metal panels.
- B. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal panels.
- C. Division 07 Section "Thermal Insulation" for thermal insulation installed behind metal panels.
- D. Division 07 Section "Air Barriers" for air barriers within wall assembly and adjacent to wall assembly.
- E. Division 07 Section "Metal Soffit Panels" for soffit panels installed with metal wall panels.
- F. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashing items in addition to items specified in this Section.
- G. Division 13 Section "Metal Building Systems" for steel framing supporting metal panels.

1.3 REFERENCES

- A. American Architectural Manufacturer's Association (AAMA): www.aamanet.org:
 - 1. AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
 - 2. AAMA 809.2 Voluntary Specification Non-Drying Sealants.
- B. American Society of Civil Engineers (ASCE): www.asce.org/codes-standards:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International (ASTM): www.astm.org:
 - 1. ASTM A755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - 2. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 3. ASTM C920 - Specification for Elastomeric Joint Sealants.
 - 4. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
 - 5. ASTM D4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
 - 6. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 7. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 8. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

D. International Accreditation Service (IAS):

1. IAS AC472 Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B.

1.4 QUALITY ASSURANCE

- A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer accredited under IAS AC472, Part B.
- B. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum five years experience in manufacture of similar products in successful use in similar applications.
1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:
 - a. Product data, including certified independent test data indicating compliance with requirements.
 - b. Samples of each component.
 - c. Sample shop drawings from similar project.
 - d. Project References: Minimum of five installations not less than three years old, with Owner and Architect contact information.
 - e. Sample warranty.
 - f. Certificate of accreditation under IAS AC472 Part B.
 2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
 3. Approved manufacturers must meet separate requirements of Submittals Article.
- C. Installer Qualifications: Experienced Installer with minimum of five years experience with successfully completed projects of a similar nature and scope.
1. Installer's Field Supervisor: Experienced mechanic supervising work on site whenever work is underway.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Prior to erection of framing, conduct preinstallation meeting at site attended by Owner, Architect, metal panel installer, metal panel manufacturer's technical representative, inspection agency and related trade contractors.
1. Coordinate building framing in relation to metal panel system.
 2. Coordinate openings and penetrations of metal panel system.
 3. Coordinate work of Division 07 Sections "Roof Specialties" and "Roof Accessories" and openings and penetrations and manufacturer's accessories with installation of metal panels.

1.6 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for specified products. Include data indicating compliance with performance requirements.
- B. Shop Drawings: Show layouts of metal panels. Include details of each condition of installation, panel profiles, and attachment to building. Provide details at a minimum scale 1-1/2-inch per foot of edge conditions, joints, fastener and sealant placement, flashings, openings, penetrations, and special details. Make distinctions between factory and field assembled work.
1. Indicate points of supporting structure that must coordinate with metal panel system installation.
 2. Include structural data indicating compliance with performance requirements and requirements of local authorities having jurisdiction.

- B. Samples for Initial Selection: For each exposed product specified including sealants. Provide representative color charts of manufacturer's full range of colors.
- C. Samples for Verification: Provide 12-inch- (305 mm-) long section of each metal panel profile. Provide color chip verifying color selection.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Indicating compliance of products with requirements.
- B. Qualification Information: For Installer firm and Installer's field supervisor.
- C. IAS Accreditation Certificate: Indicating that manufacturer is accredited under provisions of IAS AC472 Part B.
- D. Manufacturer's warranty: Unexecuted sample copy of manufacturer's warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Manufacturer's Warranty: Executed copy of manufacturer's warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect products of metal panel system during shipping, handling, and storage to prevent staining, denting, deterioration of components or other damage. Protect panels and trim bundles during shipping.
 - 1. Deliver, unload, store, and erect metal panels and accessory items without misshaping panels or exposing panels to surface damage from weather or construction operations.
 - 2. Store in accordance with Manufacturer's written instruction. Provide wood collars for stacking and handling in the field.
 - 3. Shield foam insulated metal panels from direct sunlight until installation.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within one year from date of Substantial Completion.
- B. Special Panel Finish Warranty: On Manufacturer's standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within the warranty period, as follows:
 - 1. **Fluoropolymer Two-Coat System:**
 - a. Basis of Design System: **MBCI, Signature 300.**
 - b. Color fading in excess of 5 Hunter units per ASTM D2244.
 - c. Chalking in excess of No. 8 rating per ASTM D4214.
 - d. Failure of adhesion, peeling, checking, or cracking.
 - e. Warranty Period: 40 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design Manufacturer: **MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.**; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbc.com.
- B. Morin / A Kingspan Group Company; www.kingspan.com/us/en-us/product-groups/metal-roof-wall-systems; 1975 Eidson Drive, Florida, 32724; Phone: 860.584.0900 or 800.640.9501
- C. PAC-CLAD; www.pac-clad.com: 1005 Tonne Road, Elk Grove Village, IL 60007; Ph: 800-PAC-CLAD

- D. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- B. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E1592:
 - 1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
 - a. Wind Negative Pressure: Certify capacity of metal panels by actual testing of proposed assembly.
 - 2. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/120 of the span with no evidence of failure.
 - 3. Seismic Performance: Comply with ASCE 7 Sections 9, "Earthquake Loads."
- C. Wall Panel Air Infiltration, ASTM E283:
 - 1. No air infiltration at static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- D. Wall Panel Water Penetration Static Pressure, ASTM E331: No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).
- E. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

2.3 FORMED METAL WALL PANELS

- A. Flush-Profile, Concealed Fastener Metal Wall Panels: Structural metal panels consisting of formed metal sheet with vertical panel edges and flat pan with flush joints between panels, field assembled with nested interlocking edges, and attached to supports using concealed fasteners.
 - 1. Basis of Design: **MBCI, FW-120-1 Panel. (Single Bead at 6" spacing).**
 - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A755/A755M.
 - a. Nominal Thickness: 24 gauge (Standard) coated thickness, with smooth surface.
 - i. Exterior Finish: Fluoropolymer two-coat system.
 - ii. Color: As selected by Architect from manufacturer's standard colors after Bid Date.
 - 3. Panel Width: 12 inches (305 mm).
 - 4. Panel Thickness: 1-1/2 inch (38 mm).

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panels.
- C. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant

fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.

D. Panel Sealants:

1. Factory-Applied Seam Sealant: Manufacturer's standard hot-melt type.
2. Concealed Joint Sealant: Non-curing butyl, AAMA 809.2.
3. Elastomeric Joint Sealant: Urethane sealant, single-component, ASTM C920 Type S, Grade NS, Class 25, Use NT, A, M, G, O.
4. Foam Tape: Manufacturer's standard self-adhering type.

2.5 FABRICATION

- A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

2.6 FINISHES

- A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Fluoropolymer Two-Coat System: 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621, meeting solar reflectance index requirements.
 1. Basis of Design: **MBCI, Signature 300.**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
- B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.1 METAL PANEL INSTALLATION

- A. Concealed-Fastener Formed Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, project drawings, and referenced publications. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer. Fasten panel to support structure through leading flange. Snap-fit back flange of subsequent panel into secured flange of previous panel. Where indicated, fasten panels together through flush-fitted panel sides.
 1. Cut panels in field where required using manufacturer's recommended methods.
 2. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- D. Joint Sealers: Install liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.

1. Seal panel base assembly, openings, panel head joints, and perimeter joints using joint sealers indicated in manufacturer's instructions.
2. Seal perimeter joints between window and door openings and adjacent panels using elastomeric joint sealer.
3. Prepare joints and apply sealants per requirements of Division 07 Section "[Joint Sealants](#)."

3.2 ACCESSORY INSTALLATION

- A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
 2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
 3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.3 CLEANING AND PROTECTION

- A. Clean finished surfaces as recommended by metal panel manufacturer.
- B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

SECTION 07600 - FLASHING AND SHEET METAL

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.
- B. Types of work specified in this section include the following:
 - 1. Metal Counter Flashing and Base Flashing.
 - 2. Metal Diverters. Verify location with Architect for all entry doors.
 - 3. Exposed Metal Trim Units
 - 4. Eave Strip/Drip Edge
 - 5. Fascia
 - 6. Soffit
 - 7. Coping
 - 8. Gutters
 - 9. Downspouts
 - 10. Elastic flashing.
 - 11. Elastic roof/wall expansion joint systems.
- C. Integral masonry flashings are specified as masonry work in sections of Division 4.

1.3 REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007, with Editorial Revision (2012).
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 SUBMITTALS

- A. Product Data; Flashing, Sheet Metal, Accessories: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

1.5 JOB CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage thick base metal, shop pre-coated with PVDF (Polyvinylidene Fluoride) coating.
- B. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning,
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.2 GUTTERS

- A. Gutters: Provide flat shapes, no rolled formed stiffeners or ribbed allowed. Form gutters in "continuous" sections not less than 8 feet in length, complete with end pieces, outlet tubes and other special pieces as may be required. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs.
 - 1. Furnish gutter supports spaced at 36" on center constructed of same metal as gutters.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage thick base metal, shop pre-coated with PVDF (Polyvinylidene Fluoride) coating.
- C. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning,
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.3 DOWNSPOUTS

- A. Downspouts: Form downspouts in sections approximately 10 feet long (**no corrugated sections**), complete with elbows and offsets. Join sections with not less than 1-1/2" telescoping joints. Provide fasteners, designed to securely hold downspouts not less than 1" away from walls; locate fasteners at top and bottom and equally spaced at approximately 5 feet on center in between.
- B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage thick base metal, shop pre-coated with PVDF (Polyvinylidene Fluoride) coating.
- C. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning,
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.4 METAL SOFFIT SYSTEM – STEEL SOFFIT

- A. Manufacturer: The following manufacturers' products have been used to establish minimum standard for materials, workmanship and function:
 - 1. PAC-CLAD (Basis of Design); www.pac-clad.com: 1005 Tonne Road, Elk Grove Village, IL 60007; Ph: 800-PAC-CLAD
 - 2. MBCI Manufacturing; www.mbc.com; 2280 Monier Avenue, Lithia Springs, Georgia, 30122; Phone: 844.2506 or 770.729.4772.

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3. Morin / A Kingspan Group Company; www.kingspan.com/us/en-us/product-groups/metal-roof-wall-systems; 1975 Eidson Drive, Florida, 32724; Phone: 860.584.0900 or 800.640.9501
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- C. **MATERIALS - FORMED METAL SOFFIT PANELS**
 1. **PAC-CLAD Flush Profile, Concealed Fastener Metal Soffit Panels:** Structural metal panels consisting of formed metal sheet with vertical panel edges and flat pan, with flush joints between panels, field assembled with nested lapped edges, and attached to supports using concealed fasteners.
 - a. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A755/A755M.
 - i. Nominal Thickness: 24 gauge (Standard) coated thickness, with smooth surface.
 - ii. Panel Width: 12 inches.
 - iii. Panel Thickness: 1 inch.
 - iv. Flush Narrow (Vented) Panels as indicated on drawings.
 - v. Flush Solid (Non-Vented) Panels as indicated on drawings.
 2. Finish: The exposed finish on all exposed metals and similar items shall consist of a 70% KYNAR 500® resin base coating applied to a cleaned, pretreated and primed surface. The dry film thickness of the exterior coating shall not be less than .90 mil minimum, inclusive primer. The interior color finish shall consist of a backer coat with a dry film thickness of 0.5 mil. A low gloss finish is required to minimize the appearance of oil canning.
 - a. Colors: As selected by Architect after Bid Date, from manufacturer's standard colors including white.

2.5 SHEET FLASHING

- A. Provide EPDM synthetic rubber sheet except where metal is indicated.
- B. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 1. Nervastral Seal Pruf HD-20
 2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- C. Materials:
 1. Elastic Sheet Flashing/Membrane: Manufacturer's standard flexible, elastic, black, nonreinforced, flashing sheet of 50 - 65 mils thickness.

2.6 MISCELLANEOUS MATERIALS & ACCESSORIES

- A. Solder:
 1. For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.
 2. For use with stainless steel: Provide 60 - 40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.
- B. Fasteners: Same metal as flashing/sheet metal or, other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
- C. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

- E. Epoxy Seam Sealer: 2-part noncrossive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.
- F. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/ weather-resistant seaming and adhesive application of flashing sheet.
- G. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- H. Polyethylene Underlayment: 6-mil carbonated polyethylene film; FS L-P-512.
- I. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncrossive.
- J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncrossive, size and gage required for performance.
- K. Roofing Cement: Must be compatible with materials with which it comes in contact.
- L. Provide precast concrete splashblock sloped away from building, approximately 12-inches wide x 24-inches long x 2-inches thick x 3-inches high, with 3-raised edges and one "open" end turned toward building – at locations where downspouts would otherwise drain on grade or paving.
 - 1. Provide 1-preformed metal pan with corrugated bottom and properly hemmed edges (minimum 12" x 24") at each downspout which drains onto a roof below.

2.9 FABRICATED UNITS

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 2" deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

- B. Underlayment: Where aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counter-flashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division-3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division-4 sections.
 - 1. Install counter-flashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

3.2 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.
- B. The applications for joint sealers as work of this section include the following:
 - 1. Joints (Interior).
 - 2. Joints (Exterior).
 - 3. Flashing Joints.
 - 4. Interior wall/ceiling joints.
- C. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealers to comply with this requirement will be recognized as failures of materials and workmanship.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications, handling/installation/curing instructions, and performance tested data sheets for each elastomeric product required.

1.4 JOB CONDITIONS

- A. Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature by manufacturer for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. General: Manufacturers listed in this article include those known to produce the indicated category of prime joint sealant material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.
- B. Manufacturers: The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Acrylic Emulsion Latex Sealants:
 - a. Bostik.
 - b. Pecora Corp.
 - c. Sonneborn Building Products.
 - d. Tremco, Inc.
 - 2. Polyurethane Sealants:
 - a. Bostik.
 - b. Master Builders.
 - c. Pecora Corp.
 - d. Sonneborn Building Products.
 - e. Tremco, Inc.

3. Butyl Sealants:
 - a. Bostik.
 - b. TEC Incorporated.
 - c. Tremco, Inc.
4. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. NOTE: The use of silicone sealants shall not be used at any exterior conditions.
- B. General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component. (Silicone sealant shall not be used at exterior conditions).
 1. Color: Standard colors matching finished surfaces.
 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry, stone or concrete.
 - 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. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
 1. Applications: Use for:
 - a. Concealed sealant bead in sheet metal work.
- D. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, single component, paintable.
 1. Color: Standard colors matching finished surfaces.
 2. 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.
- E. Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, nonskinning.
 1. Applications: Use for concealed locations only:
 - a. Sealant bead between top stud runner and structure and between bottom stud track and floor or wall.
- F. Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, M and A; single component.
 1. Color: Standard color matching finished surfaces.
 2. Applications: Use for:
 - a. Joints in sidewalks and paving, either vehicular or pedestrian.
 - b. Isolation joints and control joints in slabs on grade.
- G. Bituminous and Fiber Joint Filler (BtmF-JF) provide resilient and non-extruding type premolded bituminous-impregnated fiberboard units complying with ASTM D 1751; FS HH-F-341, Type I; or AASHTO M213.

H. Miscellaneous Materials:

1. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
2. Bond Breaker Tape (BB-Tp): Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
3. Sealant Backer Rod (S-BR): provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.
 - a. Rod Size to Joint Width: Size of all backer rod width shall be 2 times the width of joint/gap to be sealed.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Installer must examine substrate, (joint surfaces) and conditions under which joint sealer work is to be performed and must notify Prime Contractor of unsatisfactory conditions.

3.2 JOINT PREPARATION

- A. Clean joint surfaces immediately before installation of gaskets, sealants or caulking compounds. Remove dirt, insecure coatings, moisture and other substrate which could interfere with seal of gasket or bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.
- B. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown on specified, and except where manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealant. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
- D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.
- E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of beads;
- G. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
- H. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever

means may be necessary to eliminate evidence of spillage.

- I. Recess exposed edges of gaskets and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.
- J. Bond ends of gaskets together with adhesive of “weld” by other means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.

3.4 CURE AND PROTECTION

- A. Cure sealants and caulking compounds in compliance with manufacturer’s instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Prime Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in manner which will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION

SECTION 08100 - STEEL DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. This Section includes:
 - 1. Steel Doors
 - 2. Steel Frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section " Wood Doors" for solid-core wood doors installed in steel frames.
 - 3. Division 8 Section "Finish Hardware" for door hardware and weatherstripping.
 - 4. Division 8 Section "Glazing" for glass in steel doors and sidelights.
 - 5. Division 9 Section "Gypsum Board Assemblies".
 - 6. Division 9 Section "Painting".

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- E. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for factory-finished doors and frames.
- F. Samples for verification of each type of exposed finish required, prepared on Samples not less than 3 by 5 inches (75 by 125 mm) and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- G. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for

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Standard Steel Doors and Frames" and as specified.

- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Pioneer Industries
 - 2. Rocky Mountain Metals, Inc.
 - 3. Republic Doors & Frames/Allegion
 - 4. Steelcraft - Allegion

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M)
- C. Galvannealed Steel Sheets: Galvannealed Steel Sheet: ASTM A 653/ A 653M, commercial quality, hot dipped. Coating Thickness: A60 coating.
- D. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

- A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:

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1. Interior Doors: Grade 2, heavy-duty, Model 1, visible edge seam design, 18 gauge / minimum 0.0478-inch thick cold-rolled steel sheet faces.
 2. Exterior Doors: Grade 3, heavy-duty, Model 1, visible edge seam design, 16 gauge / minimum 0.0635-inch thick A60 galvanized steel sheet faces.
- B. Door Louvers: Provide louvers according to SDI 111C for interior doors where indicated, with blades or baffles formed of 0.0239-inch- (0.6-mm-) thick cold-rolled steel sheet set into minimum 0.0359-inch- (0.9-mm-) thick steel frame.
1. Sight-Proof Louvers: Stationary louvers constructed with inverted V- shaped or Y-shaped blades.
- C. Low Profile Lite Kits: All lite kits must be minimum 18 ga. cold rolled steel, mitered and welded corners, welded reinforcing clips at corners, counter-sunk mounting screw- holes.

2.4 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules.
- B. Conceal fastenings, unless otherwise indicated. Fabricate frames as follows:
1. Fabricate frames with mitered or coped and face welded corners.
 2. Interior Frames: 16 gage cold rolled steel
 3. Exterior Frames: 14 gage A60 galvanized steel.
- C. Door Silencers: Except on weather stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- D. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- E. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry."

2.5 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Interior Doors: 3/4" Cell Honeycomb
 - b. Exterior Doors: Insulated Polystyrene
 2. Clearances:
 - a. Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors.
 - b. Not more than 3/4 inch (19 mm) at bottom.
 - c. Fire Doors: Provide clearances according to NFPA 80.
 3. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- B. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112.
1. At exterior locations.

- 2. Where indicated.
- C. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- (1.6-mm-) thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
- D. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- E. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
 - 1. Unless otherwise indicated, provide thermal-rated assemblies with U- value rating of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better
- F. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier.
- G. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
 - 1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- H. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- I. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
- J. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.
 - 1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes. Apply primers and organic finishes to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

- A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC- Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-

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SP 8 (Pickling).

- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 - 2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 - 3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
 - 4. Install fire-rated frames according to NFPA 80.
- A. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
 - 1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
 - 2. Smoke-Control Doors: Comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08211 - WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid core doors with wood veneer faces.
 - 2. Factory finishing of flush wood doors.
 - 3. Louvers for flush wood doors.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
 - 1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
- D. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:
 - 1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.
 - 2. Faces of factory-finished doors with opaque finish. Show the full range of colors available.
- E. Samples for verification in the form and size indicated below:
 - 1. Corner sections of doors approximately 12 inches (300 mm) square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

1.4 QUALITY ASSURANCE

- A. Quality Standard: Comply with the following standard:
 - 1. NWWDA Quality Standard: I.S.1-A, "Architectural Wood Flush Doors," of the National Wood Window and Door Association.
 - 2. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.
- B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Oversized Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide manufacturer's certificate stating that doors conform to all standard construction requirements of tested and labeled fire-door assemblies except for size.
 - 2. Temperature Rise Rating: At stairwell enclosures, provide doors that have a temperature rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

3. Temperature Rise Rating: At stairwell enclosures, provide doors that have a temperature rise rating of 250 deg F (139 deg C) maximum in 30 minutes of fire exposure.

C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 DELIVERY, STORAGE & HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

1. Comply with Technical Bulletin 420-R for delivery, storage, and handling of doors.

B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

2. Warranty shall be in effect during the following period of time after date of Substantial Completion.

a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work (No other Manufacturer to be used unless prior approved by addenda)

B. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:

1. Eggers Industries
2. Chappell Door Company
3. Haley Brothers, Inc.
4. Oshkosh Door Company

2.2 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for Transparent Finish: Comply with the following requirements:

1. Faces: Plain Sliced White Birch, Book/Run Matching
2. Grade: Premium "A"
3. Construction: 5 ply, Hot Pressed

4. Core: Particleboard Core to meet or exceed ANSI/A208.1 for 1-LD-1 or 1-LD-2 door core
 5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
 6. Pair Matching: Required at all pairs of doors.
- B. Fire-Rated Solid Core Doors: Comply with the following requirements:
1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
 2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
 3. Edge Construction: Provide manufacturer's standard laminated-edge construction for improved screw-holding capability and split resistance compatible hardwood
 4. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.
 5. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.3 FABRICATION

- A. Fabricate flush wood doors to comply with following requirements:
1. In sizes indicated for job-site fitting.
 2. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
 - a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
 3. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
 - b. Metal Astragals: Pre-machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.

2.4 SHOP PRIMING

- A. Transparent Finish: Shop-seal faces and edges of doors for transparent finish with stain (if required), other required pretreatments, and first coat of finish as specified.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard's requirements for factory finishing.
- B. Finish wood doors at factory.
- C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
1. Grade: Premium.
 2. Finish: AWI System TR-6 or better in Factory standard color as directed by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see Division 8 Section "Door Hardware."
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch (6.4-mm) clearance from bottom of door to top of threshold.
 - 2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
 - 3. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 4. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish after installation, if fitting or machining is required at the job site.

3.3 ADJUSTING AND PROTECTION

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08305 - CEILING ACCESS DOORS

PART 1 - GENERAL

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.

1.1 DESCRIPTION OF WORK

- A. Ceiling Access Doors as indicated on drawings.

- 1. **Recessed Access Doors.**

1.2 QUALITY ASSURANCE

- A. Furnish each access door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications for fabrication and installation, including data substantiating that products comply with requirements.
- B. Shop Drawings: Submit for fabrication and installation of ceiling access doors and frames. Include details of each frame type, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.
- B. Inspect metal work upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store access doors and frames at building site under cover, store on floors in manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately.

1.5 WARRANTY

- A. Manufacturer shall warrant that the Access Doors ("Product ") are free from manufacturing defects at the time of sale. Manufacturer further warrants the Product will not prematurely deteriorate because of weathering for a period of one (1) year from date of sale.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Milcor | www.milcorinc.com | 5030 Corporate Exchange Blvd. SE Grand Rapids, MI 49512 | Ph.:(800) 624-8642 | Email: info@milcorinc.com.
 - 2. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 RECESSED ACCESS DOOR FOR ACOUSTICAL TILE CEILING

- A. RECESSED STEEL

1. Ordering Sequence: **Model Number 3205034**, Series: (**AT**), Size: Width (**24**) x Length (**36**).
Length denotes hinge side. The access door shall be single leaf. The door shall be pre-assembled from the manufacturer.
2. Materials:
 - a. Door: 18 ga. cold rolled steel, recessed 1" to accept acoustical tile.
 - b. Frame: 18 ga. cold roled steel outer frame.16 ga. cold rolled steel inner frame. Frame provided with 1/4" x 1/2" slots at corners for framing attachment.
 - c. Hinge: Continuous piano hinge with stainless steel pin..
 - d. Latch: Cylinder lock (replaces one cam latch) furnished with two keys. Additional custom options available on request Finish: Powder coat - White.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify by comparing packing slip and box label that product is per specification.
- B. Verify that the substrate is dry, clean, and free of foreign matter and in compliance with requirements for installation tolerances and other conditions affecting performance. Report and correct any defects prior to any installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Refer to manufacturer's product literature for surface preparation requirements. Surfaces should be structurally sound, free of voids, spalls, loose aggregate and sharp ridges. Remove dust, dirt, debris or any other foreign materials.

3.3 INSTALLATION

- A. Verify that access door installation will not disrupt other trades.
- B. Install access doors in strict accordance with manufacturer's instructions and approved submittals.
 1. Test units for proper function and adjust until proper operation is achieved.
 2. Repair finishes damaged during installation.
 3. Restore finishes so no evidence remains of corrective work.

3.4 ADJUSTING AND CLEANING

- A. Product requires no spill or leak containment.
- B. Remove and replace access doors with damage, bowing, or warping that interferes with the installation or functionality of product. Dispose of damaged material in accordance with all governmental regulations.
- C. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.
- D. Protect completed work from subsequent construction activities as recommended by manufacturer.

END OF SECTION

SECTION 08310 COILING COUNTER DOOR

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Coiling Counter Doors.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.
- B. Section 05500 - Metal Fabrications: Support framing and framed opening.

1.3 REFERENCES

- A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- E. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- G. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
- H. NEMA MG 1 - Motors and Generators.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
- C. Preparation instructions and recommendations.
- D. Storage and handling requirements and recommendations.
- E. Details of construction and fabrication.
- F. Installation methods.
- G. Shop Drawings: Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent construction.
- H. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
- I. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each overhead coiling counter door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.
- B. Furnish overhead coiling counter door units by one manufacturer for entire project.
- C. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.
- D. Installer Qualifications: Company specializing in performing Work of this section with minimum

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three years and approved by manufacturer.

- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
- F. Install in areas designated by Architect.
- G. Do not proceed with remaining work until workmanship and installation is approved by Architect.
- H. Refinish mock-up area as required to produce acceptable work.
- I. Anchorages: Furnish all anchoring devices and provide setting drawings, templates, instructions and directions for installation of anchoring devices. Coordinate delivery with other work to avoid delay.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

1.9 WARRANTY

- A. Warranty: Manufacturer's limited door warranty for 2 years for all parts and components.
- B. Manufacturer's 2 year limited warranty for PowderGuard Premium Powder Coat Finish.
- C. Manufacturer's 4 year limited warranty for PowderGuard Zinc Powder Coat Finish.
- D. Manufacturer's 5 year limited warranty for PowderGuard Weathered Powder Coat Finish applied to complete door system.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Overhead Door Corporation, 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com; E-mail: info@overheaddoor.com.
- B. Raynor; 1101 East River Road, Dixon, IL 61021-0448; www.raynor.com; PH: 815.285.7144.
- C. Cookson; 1901 South Litchfield Road, Goodyear, AZ 85338; www.cooksondoor.com: PH: 800.294.4358

2.2 OVERHEAD COILING METAL COUNTER DOORS WITH INTEGRAL FRAME

**** NOTE TO SPECIFIER **** Overhead Door Corporation 655 and 657 Series Overhead Coiling Metal Counter Doors with integral frames are available up to a standard maximum width of 9 feet and a standard maximum height of 4 feet. Series 658 is available up to a standard maximum width of 12 feet 4 inches and a standard maximum height of 6 feet. Edit as required to suit project requirements.

- A. Anodized Aluminum Counter Doors with Integral Frame: Overhead Door Corporation, 655 Series.**

1. Curtain: Interlocking roll-formed clear anodized aluminum slats with endlock for curtain alignment. Slats, 0.040 inch (1 mm) thick, and extruded aluminum bottom bar with neoprene astragal.
2. Integral Frame and Sill: Integral stainless steel frame and sill with a #4 finish. Frame consists of 16 gauge jambs and header, with 14 gauge sill.
3. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch (0.8 mm) per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.
4. Hood: Stainless steel with a #4 finish and provided with intermediate support brackets as required.
5. Operation:
 - a. Manual push up.
6. Locking:
 - a. Cylinder lock.
7. Wall Mounting Condition:
 - a. Between jambs mounting in an existing opening.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- F. Install perimeter trim and closures.

3.4 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 08410 - ALUMINUM STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of aluminum entrances and storefronts is indicated on drawings and schedules.
- B. Types of aluminum entrances required include the following:
 - 1. Storefront type framing system for exterior applications.
 - 2. Storefront type framing system for interior applications.
 - 3. Interior and Exterior Storefront Doors.
- C. Glazing: Refer to "Glass and Glazing" section of Division 8 for glazing requirements for aluminum entrances and storefronts specified herein to be factory pre-glazed.

1.3 SYSTEM PERFORMANCES

- A. General: Provide exterior entrance and storefront assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated. System shall be of design styles indicated. System components and accessories shall be from the same manufacturer, to the maximum extent possible.
- B. Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120 degree F.
- C. Wind Loading: Provide capacity to withstand loading indicated below, tested per ASTM E 330.
 - 1. Uniform pressure of 20 psf inward and 20 psf outward.
- D. Transmission Characteristics of Fixed Framing: Comply with requirements indicated below for transmission characteristics and test methods.
 - 1. Air and Water Leakages: Air infiltration of not more than 0.06 CFM per sq. ft. of fixed area per ASTM E 283 and no uncontrolled water penetration per ASTM E 331 at pressure differential of 6.24 psf (excluding operable door edges).
 - 2. Condensation Resistance: Not less than 51 CRF per AAMA 1502.7.
 - 3. Thermal Transmittance: U-value of not more than 0.65 Btu/(hr x sf x degree F) per AAMA 1503.1.
- E. Transmission Characteristics of Entrances: Provide entrance doors with jamb and head frames which comply with requirements indicated below for transmission characteristics and test methods.
 - 1. Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 CFM for single doors and 1.0 CFM for pairs of doors per ASTM E 283 at pressure differential of 1.567 psf.
 - 2. Condensation Resistance: Not less than 48 CRF per AAMA 1502.7.
 - 3. Thermal Transmittance: U-value of not more than 0.93 Btu/(hr x sf x degree F) per AAMA 1503.1.

1.4 QUALITY ASSURANCE

- A. Drawings: Plans, elevations and details show spacings of members as well as profile and similar dimensional requirements of aluminum entrances and storefront work. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in Architect's sole judgment, such deviations do not materially detract from design concept or intended performances.

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1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, standard details, and installation recommendations for components of aluminum entrances and storefronts required for project, including test reports certifying that products have been tested and comply with performance requirements.
- B. Samples: Submit samples of each type and color of aluminum finish on 12" long sections of extrusions or formed shapes and on 6" square sheets. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

PART 2 - PRODUCTS

2.1 ALUMINUM DOORS, FRAMES & STOREFRONTS

- A. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Kawneer North America
 - 2. Tubelite, Inc.
 - 3. Coral Industries, Inc./Coral Architectural Products
 - 4. YKK AP America, Inc.
 - 5. Oldcastle
 - 6. Record
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS AND ACCESSORIES

- A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusion, ASTM B 209 for sheet/plate.
- B. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.
 - 1. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.
 - 2. Provide Phillips flat-head machine screws for exposed fasteners.
- C. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, or extruded aluminum, 0.062" minimum, of an alloy and type selected by manufacturer for compatibility with other components.
- D. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.
- E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.
- F. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.
- G. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000 or molded PVC gaskets complying with ASTM D 2287.
- H. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

- I. Glass and Glazing Materials: Provide glass and glazing materials which comply with requirements of "Glass and Glazing" section of these specifications.

2.3 HARDWARE

- A. General: Hardware shall comply with requirements of the "Americans with Disabilities Act". Refer to hardware section of Division 8 for requirements for hardware items other than those indicated herein to be provided by manufacturer of aluminum entrances.
 - 1. Push/Pull Handles: CO-9 design, by Kawneer. Finish as per the Door Schedule.
 - 2. All other hardware shall be as per Section 08700, Finish Hardware.

2.4 FRAMING

- A. Types:
 - 1. Storefront type framing system for insulated exterior applications:
 - a. Framing system shall be equal to TriFab Versaglaze 451, by Kawneer.
 - 2. Storefront type framing system for non-insulated interior applications:
 - a. Framing system shall be equal to TriFab Versaglaze 450, by Kawneer.
- B. General:
 - 1. Support Members: Extruded aluminum alloy 6063-T6 or 6061-T6 complying with ASTM B-221.
 - 2. Flashing/Closures: Formed aluminum 5005-H34 alloy, min. thickness .040", complying with ASTM B-209.
 - 3. Cap System: Manufacturer's standard cap glazing system consisting of rectangular (rafter) and beveled (horizontal) glazing gaps which will secure all sides of each light of glass against negative and positive loads.
 - 4. Fasteners: A300 stainless steel.
 - 5. Sealant: Silicone (FS TT-S-0015 43A and TT-S-0023 o.c.)

2.5 FABRICATION

- A. Sizes and Profiles: Required sizes for door and frame units, including profile requirements, are indicated on drawings. Any variable dimensions are indicated, together with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
- B. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
 - 1. Preglaze door and frame units to greatest extent possible, in coordination with installation and hardware requirements.
 - 2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
 - 3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces. For hardware, perform these operations prior to application of finishes.
- C. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.
- D. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.
- E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.
- F. Fasteners: Conceal fasteners wherever possible.

- G. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
 - 1. Provide EPDM/vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

2.6 STOREFRONT FRAMING SYSTEM

- A. General: Provide inside-outside matched center glazed system with provisions for glass replacement. Shop-fabricate and preassemble frame components where possible.

2.7 ALUMINUM DOOR FRAMES

- A. Fabricate tubular and channel frame assemblies, as indicated, with either welded or mechanical joints in accordance with manufacturer's standards, reinforced as necessary to support required loads.

2.8 STILE-AND-RAIL TYPE ALUMINUM DOORS

- A. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints, at manufacturer's option.
- B. Design:
 - 1. **Provide doors equal to Model 500 by Kawneer, wide stile design with 8" high horizontal crossrail.**
- C. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of door stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

2.9 FINISHES

- A. Baked Enamel Finish: Premium color selection equal to Kawneer #22 Stock Permafluor Architectural Coating (Hylar 5000 or Kynar 500), factory applied and oven baked for a topcoat thickness of 1.0 - 1.3 mils.
 - 1. Color to be selected by Architect after bid date from manufacturer standards
 - 2. Color selections **MUST** include "White".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.
- C. Drill and tap frames and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- D. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.
- E. Refer to "Glass and Glazing" section of Division 8 for installation of glass and spandrel panels indicated to be glazed into framing, and not preglazed by manufacturer.

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3.3 ADJUST AND CLEAN:

- A. Adjust operating hardware to function properly, without binding, and to prevent tight fit at contact points and weatherstripping.
- B. Clean completed systems, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces.
- C. Institute protective measures and other precautions required to assure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 08700 - FINISH HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following:
 - 1. Hinges.
 - 2. Key control system.
 - 3. Lock cylinders and keys.
 - 4. Lock and latch sets.
 - 5. Bolts.
 - 6. Exit devices.
 - 7. Push/pull units.
 - 8. Closers.
 - 9. Overhead holders.
 - 10. Miscellaneous door control devices.
 - 11. Door trim units.
 - 12. Protection plates.
 - 13. Weather-stripping for exterior doors.
 - 14. Sound stripping for interior doors.
 - 15. Astragals or meeting seals on pairs of doors.
 - 16. Thresholds.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section "Standard Steel Doors and Frames" for silencers integral with hollow metal frames.
 - 2. Division 8 Section "Flush Wood Doors" for factory pre-fitting and factory pre-machining of doors for door hardware.
 - 3. Division 8 Section "Aluminum Entrances and Storefronts" for aluminum entrance door hardware, except cylinders.

1.3 HARDWARE ALLOWANCE

- A. Allowance of \$1,500.00 for Certified AHC (Architectural Hardware Consultant) – (document of certification from DHI must be provided) to visit job site upon substantial completion as directed by Architect. A written inspection report will be required for the Owner, Architect, and Contractor

1.4 QUALITY ASSURANCE

- A. Door hardware supplier's responsibilities shall be as follows:
 - 1. Submittals: Submit through Contractor required product data, final hardware schedule; separate keying schedule, and samples as specified in this Section, unless otherwise indicated.

2. **Hardware Review Meeting:** Hardware Supplier shall attend a scheduled "Hardware Review Meeting" with the Contractor, Owner and Architect representative. All Hardware products, hardware installation locations, finishes, color selections, ratings and keying is to be reviewed and discussed. The Hardware Supplier understands the Hardware Submittal is not deemed "Fully Approved" until the Owner has completed their review and given "Approval".
 3. Construction Schedule: Inform Contractor promptly of estimated times and dates that will be required to process submittals, to furnish templates, to deliver hardware, and to perform other work associated with furnishing door hardware for purposes of including this data in construction schedule. Comply with this schedule.
 4. Coordination and Templates: Assist Contractor as required to coordinate hardware with other work in respect to both fabrication and installation. Furnish Contractor with templates and deliver hardware to proper locations.
 5. Product Handling: Package, identify, deliver, and inventory door hardware specified in this Section.
 6. Discrepancies: Based on requirements indicated in Contract Documents in effect at time of door hardware selection, furnish types, finishes, and quantities of door hardware, including fasteners, and Owner's maintenance tools required to comply with specified requirements and as needed to install and maintain hardware. Furnish or replace any items of door hardware resulting from shortages and incorrect items at no cost to the Owner or Contractor. Obtain signed receipts from Contractor for all delivered materials.
- B. Contractor's responsibilities shall be as follows:
1. Submittals: Coordinate and process submittals for door hardware in same manner as submittals for other work.
 2. **Hardware Review Meeting:** Contractor is to schedule and attend a "Hardware Review Meeting" with the Owner, Hardware Supplier and Architect Representative. All Hardware products, hardware installation locations, finishes, color selections, ratings and keying is to be reviewed and discussed. The Contractor understands the Hardware Submittal is not deemed "Fully Approved" until the Owner has completed their review and given "Approval".
 3. Construction Schedule: Cooperate with door hardware supplier in establishing scheduled dates for submittals and delivery of templates and door hardware. Incorporate in construction schedule the times and dates related to furnishing hardware by door hardware supplier.
 4. Coordination: Coordinate door hardware with other Work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and suitability of hardware with supplier. Coordinate all wiring, raceways, accesses and final connections to all electronic devices and components per manufacturer requirements for a fully functioning system.
 5. Product Handling: Provide secure lock-up for hardware delivered to the site. Inventory hardware jointly with representative of hardware supplier and issue signed receipts for all delivered materials.
 6. Installation Information: The general types and approximate quantities of hardware required for this Project are indicated at the end of this Section in order to establish Contractor's costs for installation and other work not included in allowance.
 7. No adjustments in Contract sum will be made for costs other than those covered by the allowances for subsequent increases or decreases in quantity of one or more hardware types that do not exceed 5 percent.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.
- B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

- C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Upon return of the reviewed finish hardware schedule, arrange for a meeting with the Owner and representatives of Architect. A keying schedule will be established and submitted to the Architect and Owner. After review, the keying schedule will be returned to representatives of Finish Hardware Supplier so that permanent cylinders and keys can be prepared on a timely basis.

1.6 QUALITY ASSURANCE

- A. Substitutions: All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.
- B. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- C. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for a minimum of 10 years, for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced " Certified "architectural hardware consultant (AHC)" as recognized by the Door and hardware Institute (DHI). All submittals shall be signed by an AHC who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.7 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.8 MAINTENANCE

- 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 HINGES

- A. MANUFACTURERES
 - 1. Ives

2. Stanley
3. Bommer

B. MATERIAL:

1. Provide only template produced units
2. Provide Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.
3. Hinge pins, except as noted, are to be provided as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-ferrous Hinges: Stainless steel pins
 - c. Exterior Doors: Use Non-Removable Pins
 - d. Interior Doors: Non-rising pins
 - e. Electric Hinges: Non-removable pins
4. Tips shall be flat button and matching plug, finished to match leaves.
5. Provide number of hinges indicated but not less than three (3) hinges for door leaf of 90" or less in height and one additional hinge for each 30" of additional height.
6. Provide ball bearing hinges of the type and weight suggested by the hinge manufacturer for each type of door application.

2.2 LOCK CYLINDERS AND KEYING:

A. MANUFACTURER

1. Corbin/Ruswin

B. MATERIAL

1. Existing System: Master key lock cylinders to the Owner's existing master key system. All lock cylinders shall be standard 6-pin or small/large format interchangeable core as required to integrate with the owner's existing key system. Hardware supplier shall field verify with the owner the cylinder type and C/R keyway required. Key all cylinders as directed by the owner.
2. Provide temporary brass construction cores for all locks and exit devices for use by general contractor during construction. If key system employs standard 6-pin cylinders provide drop ball construction master keying. At the completion of the project, the General Contractor shall remove temporary cores and install all permanent cores. If drop ball construction keying is employed, the general contractor shall void the construction key system using permanent operating keys/master keys. General contractor shall verify functionality of permanent cylinders/cores.
3. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated into the Owner's existing system.
4. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
5. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
6. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE". Permanent cores shall be stamped or engraved with manufacturer's key set symbol in a concealed location.
7. Key Material: Provide keys of nickel silver only.
8. Key Quantity: Furnish (3) change keys for each lock, (5) master keys for each master system, (5) grandmaster keys for each grandmaster system, (12) construction master keys.

- a. Furnish 50 key blanks.
- b. Furnish construction master keys to General Contractor.
- c. Deliver keys to Owner.

2.3 ACCESSORIES:

Key Cabinet: Provide one surface wall mount key cabinet, Lund Deluxe 1200 series, two tag key system. Capacity shall be 150% of number keys required for the project. General contractor shall install key cabinet in location to be determined by the architect.

2.4 LOCKSETS AND LATCHSETS

A. MANUFACTURERES

1. Corbin Russwin ML2000 Series, NSA Design (Owner Standard)

B. MATERIAL

1. Locksets and latch-sets of all manufacturers must conform to the requirements of Sub paragraphs 2 and be approved by the Architect.
2. Mortise Lock Type
 - a. Locksets and latch sets must conform to ANSI A156.2 Series 1000, Operational Grade 1, and be UL Listed.
3. Provide cylindrical privacy sets where specified in the door hardware sets, Schlage ND series with patented, 180 degree high-visibility lock status indicator trim: Vacant/Occupied). Red and white backgrounds to serve color blind needs. Maximized message size.

2.5 EXIT DEVICES

A. MANUFACTURERES

1. Von Duprin 98 Series
2. Sargent 19-43-GL-80 Series
3. Detex 10 Series

B. MATERIAL

1. All exit devices for non-fire rated doors, fire rated doors and ICC500 rated Tornado doors shall be of the same manufacturer and provided in same finish design as locksets.
2. Provide sex nuts and bolts for attachment of surface applied items to doors.
3. Devices shall be UL listed. Devices for fire rated openings shall bear factory installed UL markings that indicate approval for fire rated openings.
4. All exit devices shall be touch-bar type design.
5. All exit devices shall comply with ANSI A156.3, Grade 1.
6. Exit device lever trim shall be equal to Von Duprin break away vandal resistant #996L.
7. All exit devices shall be equipped with flush end caps.
8. All exit devices shall be equipped with guarded (deadlocking) latch bolts.
9. Security Indicators for "Keyed Cylinder Dogging" - Provide Von Duprin "CDSI", dogging indicator provides an at-a-glance verification of the status of the door from inside of the room. Visible "LOCKED" and "UNLOCKED" indicators show whether the device is undogged or dogged.
10. Security Indicators for "-2SI-Classroom Exit Device Locking Lever Trim". The "-2SI" Security Indicator provides an at-a-glance verification of the LOCKED/UNLOCKED status of the door

from inside of the room. Facility staff to be able to lock/unlock outside exit device lever trim from classroom side of door, avoiding corridor exposure.

11. All exit devices shall be provided with anti-microbial coated stainless steel touch bars. Plastic touch pads or plastic covered touch pads will not be accepted.
12. All exit devices are to be installed using through-bolts. All exit devices and exit device strikes shall be installed using manufacturer's supplied fasteners. Substitution of manufacturer's fasteners will not be allowed.

2.6 CLOSERS

A. MANUFACTURERES

1. LCN 4000 Series
2. Sargent 281 Series
3. Norton 9500 Series

B. MATERIAL

1. Size of units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
 - a. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
 - b. Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units, ANSI opening force and delayed action closing.
2. Closers are to be fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons. Closer Piston diameter for all closers shall be minimum 1½". Hydraulic regulation to be controlled by tamper-proof, non-critical screw valves, adjustable with a hex by tamper-proof, non-critical screw valves, adjustable with a hex wrench. Separate adjustments for back check, general speed, and latch speed. Where detailed in the door hardware sets, provide delayed action feature to delay closing up to one minute for maximum opening to approximately 75. Back check shall be properly located for protection of the door, frame and applied hardware.
3. All door closers shall comply with ANSI A156.4 Grade 1 and meet the standards of ANSI A117.1 for barrier-free accessibility.
4. Provide closers with full metal covers.
5. All closers are to be through bolt mounted. All door closers are to be installed using manufacturer supplied fasteners. Substitution of manufacturers supplied fasteners is not permitted.
6. All surface door closers are to be provided with required mounting brackets, mounting plates, drop plates, shims, spacers, arms, special templating, etc. as required for the specified closer and arm function, whether specified in the door hardware sets or not.

2.7 OVERHEAD STOPS AND HOLDERS

A. MANUFACTURERES

1. Glynn Johnson
2. Sargent
3. Rixson

B. MATERIAL

1. Conform to ANSI A156.8 Grade 1.

2.8 PUSH/PULLS & PROTECTION PLATES

A. MANUFACTURERES

New Gymnasium at Appalachian School for the
Blount County Board of Education
Oneonta, Alabama

FINISH HARDWARE
08700-6

1. Ives
2. Trimco
3. Burns

B. MATERIAL

1. Provide manufacturers standard exposed fasteners for installation, through bolted for matched pairs, but not of single units.
2. Provide 16 gauge minimum thickness for plates.
3. Where specified in the schedule, push/pulls shall have an antimicrobial coating.

2.9 THRESHOLDS, WEATHERSTRIPPING & GASKETING

A. MANUFACTURERES

1. Zero
2. National Guard
3. Reese

B. MATERIAL

1. Provide continuous weather-stripping at each edge of every exterior door leaf, except as otherwise indicated.
2. Provide type, size and profile shown as scheduled.
3. Provide non-corrosive fasteners as recommended by manufacturer for application indicated. Do not specify adhesive backed weather-strip or gasket material.
4. Where replaceable seal strips are scheduled, provide only those units where resilient or flexible seal strip is easily replaceable from stocks maintained by manufacturer.
5. Proved standard metal threshold unit of type, size and profile shown as scheduled.

2.10 FINISHES

- A. Hardware finishes shall conform to ANSI and shall be as listed below for aluminum, FRP, hollow metal and wood doors:

B. Finishes Table:

Butt Hinges	Interior Doors: 652 Satin Chrome Plated Steel
Continuous Geared Aluminum Hinges	628 Clear Anodized Aluminum at wood and hollow metal doors. Aluminum Doors: provide custom anodized aluminum finish or custom Kynar paint finish as required to match the specified frame/door finish.
Flush Bolts	626 Satin Chrome Plated
Locksets	626AM Satin Chrome Plated, w/anti-microbial coating
Pulls	630AM Satin Chrome Plated, w/anti-microbial coating
Exit Devices	626AM Satin Chrome Plated, with 630AM Satin Stainless Steel touch bars, w/anti-microbial coating
Door Closers	689 Powder Coat Aluminum
Protective Plates	630 Satin Stainless Steel
Door Stops	626 Satin Chrome Plated
Overhead Holders	630 Satin Stainless Steel

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install each hardware item in compliance with manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, reinstall each item.

- 1. Do not install surface mounted items until finishes have been completed on the substrate.

- B. Conform to ANSI A117.1 for positioning requirements for the handicapped.

3.2 PROTECTION AND CLEANING

- A. After installation, clean metal surfaces on both interior and exterior of all mortar, paint and other contaminants. After cleaning, protect work against damage.

3.3 FINAL ADJUSTMENT

- A. Whenever hardware is installed more than one month prior to occupancy or acceptance, return during the week prior to acceptance or occupancy and make a final inspection and adjustment of all hardware items in such space or area.

3.4 SCHEDULE

HARDWARE SET: 01

DOOR NUMBER:

003A 003B 003C 008B 009

EACH TO HAVE:

2	CONTINUOUS HINGE	224HD (EPT-NOTCH AS REQ'D)	IVE
1	POWER TRANSFER HINGE	EPT-10-CON (RHR-ACT. LEAF – FOR FUTURE USE)	VON
1	KEYED REMOVABLE MULL	KR4954	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	CDSI-98-EO-990EO-299-SNB	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	CDSI-98-NL-990NL-299-SNB	VON
1	RIM CYLINDER/CORE	TYPE AS REQ'D	
3	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
2	SURFACE CLOSERS	4111 SCUSH TBSRT	LCN
2	KICK PLATES	8400 8" X 2" LDW B-CS	IVE
1	MULLION SEAL	139N PSA	ZER
1	THRESHOLD	65A	ZER
2	DOOR BOTTOM SWEEPS	8198AA	ZER
1	WEATHER STRIP	8144S-BK-PSA	ZER
2	MEETING EDHE SEALS	326AA	ZER
1	OVERHEAD RAIN DRIP CAP	142A	ZER

HARDWARE SET: 02

DOOR NUMBER:

113B

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD (EPT-NOTCH AS REQ'D)	IVE
1	POWER TRANSFER HINGE	EPT-10-CON (FOR FUTURE USE)	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	CDSI-98-NL-990NL-299-SNB	VON
1	RIM CYLINDER/CORE	TYPE AS REQ'D	
1	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
1	SURFACE CLOSERS	4111 SCUSH TBSRT	LCN
1	KICK PLATES	8400 8" X 2" LDW B-CS	IVE
1	THRESHOLD	65A	ZER
1	DOOR BOTTOM SWEEPS	8198AA	ZER
1	WEATHER STRIP	8144S-BK-PSA	ZER
1	OVERHEAD RAIN DRIP CAP	142A	ZER

HARDWARE SET: 03

DOOR NUMBER:

010B

027A

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD (EPT-NOTCH AS REQ'D)	IVE
1	POWER TRANSFER HINGE	EPT-10-CON (FOR FUTURE USE)	VON
1	EXIT DEVICE (EXIT ONLY)	98-EO-990EO-299-SNB	VON
1	SURFACE CLOSERS	4111 SCUSH TBSRT	LCN
1	KICK PLATES	8400 8" X 2" LDW B-CS	IVE
1	THRESHOLD	65A	ZER
1	DOOR BOTTOM SWEEPS	8198AA	ZER
1	WEATHER STRIP	8144S-BK-PSA	ZER
1	OVERHEAD RAIN DRIP CAP	142A	ZER

HARDWARE SET: 04

DOOR NUMBER:

031

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD	IVE
1	STOREROOM LOCKSET	ML2057	COR
1	SURFACE CLOSER	4111 CUSH TBSRT	LCN
1	THRESHOLD	65A	ZER
1	DOOR BOTTOM SWEEPS	8198AA	ZER
1	WEATHER STRIP	8144S-BK-PSA	ZER
1	OVERHEAD RAIN DRIP CAP	142A	ZER

HARDWARE SET: 05

DOOR NUMBER:

107A

108A

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD	IVE
1	PUSH PLATE	8200-8" X 16"	TRI
1	PULL PLATE	8303-8" PULL, 4" X 16" PLATE	IVE
1	SURFACE CLOSER	4011 TBSRT	LCN
1	KICK PLATE	8400 8 X 1 1/2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 06

DOOR NUMBER:

001

025

EACH TO HAVE:

2	CONTINUOUS HINGES	224HD	IVE
2	MANUAL FLUSH BOLTS	458-112	IVE
1	DUST PROOF STRIKE	DP2	IVE
1	CLASSROOM DEADLOCK	ML2017	COR
2	PUSH PLATES	1820-3.5" X 16.5"	TRI
2	PULL PLATES	8303-8" PULL, 4" X 16" PLATE	IVE
2	SURFACE CLOSER	4111 HSCUSH TBSRT	LCN
2	ARMOR PLATES	8400 36 X 1" LDW B-CS	IVE
2	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
2	SILENCERS	SR64	IVE

HARDWARE SET: 07

DOOR NUMBER:

105A

015

023

013

028

EACH TO HAVE:

3	BUTT HINGES	5BB1 4.5 X 4.5 (5 X 4.5 @ DOOR 013)	IVE
1	ENTRY LOCKSET	ML2065 NSA	COR
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 08

DOOR NUMBER:

106

EACH TO HAVE:

3	BUTT HINGES	5BB1 4.5 X 4.5	IVE
1	CLASSROOM LOCKSET	ML2055 NSA	COR
1	MOP PLATE	8400 6" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 09

DOOR NUMBER:

016 024 029

EACH TO HAVE:

3	BUTT HINGE	3CB1 4.5 X 4.5	IVE
1	PRIVACY SET	ML2030	COR
1	SURFACE CLOSER	4011/4111 TBSRT	LCN
1	KICK PLATE	8400 8 X 1 1/2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 10 (TOILET STALL DOORS)

DOOR NUMBER:

107B 107C 108B 108C 108D 108E
108F 108G 108H 108I

EACH TO HAVE:

1	BUTT HINGE	3CB1 4.5 X 4.5	IVE
2	SPRING HINGES	3SP1 4.5 X 4.5	IVE
1	PRIVACY SET W/180 DEGREE VISIBILITY INDICATOR: VACANT/OCCUPIED	ND40 OS-OCC RHO 10-025 MAX MESSAGE SIZE, RED/WHITE BACK GROUNDS FOR THE COLOR BLIND	SCH
1	WALL STOP (OUTSWING DOOR)	WS401/402CVX	IVE
1	WALL BUMPER (INSWING DOORS)	WS11/WS11X-TYPE AS REQ'D GIVEN WALL CONSTRUCTION	IVE
1	COAT HOOK	508	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 11

DOOR NUMBER:

005 006 017 021

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD	IVE
1	CLASSROOM SECURITY LOCKSET W/INSIDE SECURITY INDICATOR: LOCKED/UNLOCKED	ML2002 W/INSIDE SECURITY INDICATOR: LOCKED/UNLOCKED	COR
1	SURFACE CLOSER	4011 TBSRT	LCN
1	ARMOR PLATE	8400 34" X 1 1/2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 12

DOOR NUMBER:

113A

EACH TO HAVE:

2	CONTINUOUS HINGE	224HD	IVE
1	KEYED REMOVABLE MULL	KR9954	VON
1	EXIT DEVICE	98-EO-F-996EO-SNB	VON
1	EXIT DEVICE W/CLASSROOM SECURITY TRIM AND VISIBLE AT DISTANCE SECURITY INDICATOR	98-L-F-2SI-996L-06-299-SNB	VON
1	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
2	RIM CYLINDER/CORE	TYPE AS REQ'D	
2	SURFACE CLOSERS	4111 EDA TBSRT	LCN
2	KICK PLATES	8400 8" X 2" LDW B-CS	IVE
2	MOP PLATES	8400 6" X 1" LDW B-CS	IVE
2	WALL STOPS	WS401/402CVX	IVE
1	MULLION SEAL	139N PSA	ZER
1	GASKETING	188S-BK-PSA	ZER
2	MEETING EDGE SEALS	328AA	ZER

HARDWARE SET: 13

DOOR NUMBER:

008C

EACH TO HAVE:

2	CONTINUOUS HINGE	224HD	IVE
1	KEYED REMOVABLE MULL	KR4954	VON
1	EXIT DEVICE	98-EO-996EO-SNB	VON
1	EXIT DEVICE W/CLASSROOM SECURITY TRIM AND VISIBLE AT DISTANCE SECURITY INDICATOR: LOCKED/UNLOCKED	98-L-2SI-996L-06-299-SNB	VON
1	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
2	RIM CYLINDER/CORE	TYPE AS REQ'D	
2	SURFACE CLOSERS	4111 EDA TBSRT	LCN
2	KICK PLATES	8400 8" X 2" LDW B-CS	IVE
2	MOP PLATES	8400 6" X 1" LDW B-CS	IVE
2	WALL STOPS	WS401/402CVX	IVE
1	MULLION SEAL	139N PSA	ZER
2	SILENCERS	SR64	IVE

HARDWARE SET: 14

DOOR NUMBER:

105B

105C

ALL HARDWARE PROVIDED BY COILING DOOR SUPPLIER/MFG

HARDWARE SET: 15

DOOR NUMBER:

011

EACH TO HAVE:

6	BUTT HINGES	5BB1 4.5 X 4.5 NRP	IVE
1	KEYED REMOVABLE MULL	KR4954	VON
1	EXIT DEVICE	98-EO-996EO-299-SNB	VON
1	EXIT DEVICE	98-NL-990NL-299-SNB	VON
1	RIM CYLINDER/CORE	TYPE AS REQ'D	
1	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
2	SURFACE CLOSERS	4111 CUSH TBSRT	LCN
2	MOP PLATES	8400 6" X 1" LDW B-CS	IVE
2	WALL STOPS	WS401/402CVX	IVE
1	MULLION SEAL	139N PSA	ZER
2	SILENCERS	SR64	IVE

HARDWARE SET: 16

DOOR NUMBER:

110

111

113C

010A

027B

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD	IVE
1	EXIT DEVICE W/CLASSROOM SECURITY TRIM AND VISIBLE AT DISTANCE SECURITY INDICATOR	98-L-F-2SI-996L-06-299-SNB	VON
2	RIM CYLINDER/CORE	TYPE AS REQ'D	
1	SURFACE CLOSERS	4111 EDA TBSRT	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKETING	188S-BK-PSA	ZER

HARDWARE SET: 17

DOOR NUMBER:

008A

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD	IVE
1	EXIT DEVICE W/CLASSROOM SECURITY TRIM AND VISIBLE AT DISTANCE SECURITY INDICATOR	98-L-2SI-996L-06-299-SNB	VON
2	RIM CYLINDER/CORE	TYPE AS REQ'D	
1	SURFACE CLOSERS	4111 EDA TBSRT	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: 18

DOOR NUMBER:

026

103

104

112

EACH TO HAVE:

3	BUTT HINGES	5BB1 4.5 X 4.5 NRP	IVE
1	STOREROOM LOCKSET	ML2057 NSA	COR
1	SURFACE CLOSER	4111 SCUSH TBSRT	LCN
1	KICK PLATE	8400 8" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
3	SILENCERS	SR64	IVE
1	GASKET SEAL	188S-BK (DOORS 026 AND 112 ONLY)	ZER

HARDWARE SET: 19

DOOR NUMBER:

019A

019B

EACH TO HAVE:

1	CONTINUOUS HINGE	224HD	IVE
1	STOREROOM LOCKSET	ML2057 NSA (KEYED CYLINDER ON LOCKER ROOM SIDE OF DOOR)	COR
1	SURFACE CLOSER	4111 EDA TBSRT	LCN
1	ARMOR PLATE	8400 34 X 1 1/2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCERS	SR64	IVE

HARDWARE SET: AL-01

DOOR NUMBER:

101A

EACH TO HAVE:

2	CONTINUOUS HINGE	112HD (EPT-NOTCH AS REQ'D)	IVE
1	POWER TRANSFER HINGE	EPT-10-CON (RHR-ACT. LEAF - FOR FUTURE USE)	VON
1	KEYED REMOVABLE MULL	KR4954	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	CDSI-35A-EO-299	VON
1	EXIT DEVICE W/VISIBLE AT DISTANCE LOCKED/UNLOCKED SECURITY INDICATOR	CDSI-35A-NL-OP-388-299	VON
1	RIM CYLINDER/CORE	TYPE AS REQ'D	
3	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
2	SPECIAL OFFSET PULLS	8190EZHD-18-O MOUNT	IVE
2	CONCEALED OH STOPS	100S	GLY
2	SURFACE CLOSERS	4021 TBSRT	LCN
2	SURFACE CLOSER MOUNTING PLATES	4020-18G	LCN
1	MULLION SEAL	139N PSA	ZER
1	THRESHOLD	65A	ZER
1	WEATHER SEALS	PROVIDED BY ALUMINUM FRAME/DOOR SUPPLIER	

HARDWARE SET: AL-02

DOOR NUMBER:

101B

101C

EACH TO HAVE:

2	CONTINUOUS HINGE	112HD	IVE
1	KEYED REMOVABLE MULL	4954	VON
2	EXIT DEVICE W/VISIBLE AT DISTANCE	CDSI-35A-EO-299	VON
	LOCKED/UNLOCKED SECURITY INDICATOR		
2	MORTISE CYLINDER/CORE	TYPE AS REQ'D	
2	SPECIAL OFFSET PULLS	8190EZHD-18-O MOUNT	IVE
2	CONCEALED OH STOPS	100S	GLY
2	SURFACE CLOSERS	4021 TBSRT	LCN
2	SURFACE CLOSER MOUNTING PLATES	4020-18G	LCN
1	MULLION SEAL	139N PSA	ZER
1	THRESHOLD	65A	ZER
1	WEATHER SEALS	PROVIDED BY ALUMINUM FRAME/DOOR SUPPLIER	

HARDWARE SET: AL-03

DOOR NUMBER:

102A

102B

102C

EACH TO HAVE:

2	CONTINUOUS HINGE	112HD	IVE
2	DUMMY TOUCH BARS	350	VON
2	SPECIAL OFFSET PULLS	8190EZHD-18-O MOUNT	IVE
2	CONCEALED OH STOPS	100S	GLY
2	SURFACE CLOSERS	4021 TBSRT	LCN
2	SURFACE CLOSER MOUNTING PLATES	4020-18G	LCN
1	WEATHER SEALS	PROVIDED BY ALUMINUM FRAME/DOOR SUPPLIER	

END OF SECTION

SECTION 08800 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass for windows
 - 2. Glass for doors
 - 3. Glass for interior borrowed lites
 - 4. Glass for storefront framing.
 - 5. Glazing sealants and accessories.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass as defined in referenced glazing publications.
- B. Glass Fabricators: Firms that produce the fabricated glass products. Fabrication processes include cutting, heat processing, insulating, spandrel, laminating and other as fabrication activities defined in referenced glazing publications.

1.3 REFERENCE STANDARDS

- A. American Society of Test and Material (ASTM)
 - 1. ASTM C1036: Standard Specification for Flat Glass
 - 2. ASTM C1048: Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass
 - 3. ASTM C1172: Standard Specification for Laminated Architectural Flat Glass
 - 4. ASTM C1376: Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
 - 5. ASTM E119: Standard Test Methods for Fire Tests of Building Construction and Materials
 - 6. ASTM E1886: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
 - 7. ASTM E1996: Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
 - 8. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation
- B. American National Standards Institute (ANSI)
 - 1. ANSI z97.1: For Safety Glazing Materials Used In Buildings - Safety Performance Specifications And Methods Of Test
- C. Consumer Products Safety Commission
 - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- D. International Code Council
 - 1. ICC 500: ICC/NSSA Standard for the Design and Construction of Storm Shelters
- E. Underwriters Laboratory (UL)
 - 1. UL 263: Standard for Fire Tests of Building Construction and Material
 - 2. UL 9: Standard for Fire test of Window Assemblies
 - 3. UL 10B: Standard for Fire Tests of Door Assemblies

4. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies

F. National Fire Protection Association (NFPA)

1. NFPA 80: Standard for Fire Doors and Other Opening Protectives
2. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies
3. NFPA 252: Standard Methods of Fire Test of Door Assemblies

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product provide performance characteristics, certificates of compliance, installation instructions, and cleaning and maintenance instructions.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12" x 12" inches (300 mm) square. For each type of sealant/gasket exposed to view; 12" length sample. Install sealant/gasket sample between two strips of materials representative of adjoining framing system in color.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.

1.7 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- B. Single Source Responsibility: Provide materials obtained from one source for each type of glass and glazing product indicated

1.8 PRECONSTRUCTION TESTING

Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.10 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes. Install glazing sealants only when temperatures are in middle third of manufacturer's recommended installation temperature range.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approved Manufacturers: Subject to compliance with requirements, provide AGC Glass North America, Inc or approved equal product by one of the following:
 - 1. AGC Glass North America (Basis of Design)
 - 2. Pilkington North America
 - 3. Viracon
- B. Approved Fabricators: Subject to compliance with requirements
 - 1. American Insulated Glass
 - 2. OldCastle Building Envelope
 - 3. Trulite Glass and Aluminum Solutions
 - 4. Tristar Glass

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design glazing. A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
- C. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 7.3 computer program, expressed as Btu/sq. ft. x h x deg F.
 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBNL's WINDOW 7.3 computer program.
 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: "Laminated Glazing Reference Manual", "Glazing Manual", and "Sealant Manual".
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.
- F. Heat-Treated Float Glass: Where heat treated float glass is required or indicated provide glass in accordance to ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
 - B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- D. Sputtered Coated Low-Emissivity Clear Vision Glass, ASTM C 1376, Kind CV (coated vision glass), coated by sputtered process, ASTM C 1036, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- E. Pyrolytic Coated Low-Emissivity Clear Vision Glass, ASTM C 1376, Kind CO (coated overhead glass), coated by pyrolytic process, ASTM C 1036, Type I, Class 1 (clear) or Class 2 as indicated, Quality-Q3.
- F. Ceramic-Coated Vision Glass: ASTM C 1048, Condition C, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards Manual."
- G. Reflective-Coated Vision Glass: ASTM C 1376.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seals.
 - a. Primary Seal: Polyisobutylene
 - b. Secondary Seal: Two-part Silicone
 - 2. Spacer: Manufacturer's standard spacer material and construction
 - a. Color: As select by architect from fabricators full range of colors

2.6 FIRE PROTECTIVE-RATED GLASS

- A. Fire -Protective -Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire -protection ratings indicated, based on positive -pressure testing according to NFPA 257 or UL 9, including the hose -stream test, and shall comply with NFPA 80.
 - 1. Fire -protection -rated glazing required to have a fire -protection rating of 20 minutes shall be exempt from the hose -stream test.
- B. Fire -Protective -Rated Glazing Labeling: Permanently mark fire -protection -rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose -stream test; whether or not glazing meets 450 deg F (250 deg C) temperature -rise limitation; and the fire -resistance rating in minutes.
- C. Fire -Protective -Rated Tempered Glass: 6 -mm thickness, fire -protection -rated tempered glass; and complying with 16 CFR 1201, Category II.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Safti First; SuperLite I
 - b. Technical Glass Products; Fireglass20
 - c. Vetrotech Saint-Gobain; SSG Pyroswiss US
- D. Fire-Protective Rated Ceramic: 5mm thickness, fire protective rated ceramic, non-safety rated
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Schott Pyran Platinum
 - b. Technical Glass Products Firelite
- E. Fire-Protective Rated Ceramic-Filmed: 5mm thickness, fire protective rated ceramic, safety rated, complying with 16 CFR 1201, Category II

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Schott Pyran Platinum-F
 - b. Technical Glass Products Firelite-NT
- F. Fire-Protective Rated Ceramic-Laminated: 9mm thickness, fire protective rated ceramic, safety rated, complying with 16 CFR 1201, Category II
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Schott Pyran Platinum-L
 - b. Technical Glass Products Firelite-Plus

2.7 FIRE -RESISTANCE -RATED GLAZING

- A. Fire -Resistance -Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire -resistance ratings indicated, based on testing according to ASTM E 119 or UL 263.
- B. Fire -Resistance -Rated Glazing Labeling: Permanently mark fire -resistance -rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire -resistance rating in minutes.
- C. Fire-Resistance Rated Intumescent Glazing: 16mm-52mm thickness, multiply constructed laminated with fire resistive intumescent interlayers, and complying with 16 CRF 1201, Category II.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. GC Glass - Pyrobel
 - b. Pilkington - Pyrostop

2.8 GLAZING SEALANTS

- A. General:
 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sika Corporation.
 - f. Tremco Incorporated.
- C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation-Construction Systems.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Pecora Corporation.
 - f. Polymeric Systems, Inc.
 - g. Sika Corporation.
 - h. Tremco Incorporated.

- D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - e. Polymeric Systems, Inc.
 - f. Schnee-Morehead, Inc., an ITW company.
 - g. Sika Corporation.
 - h. Tremco Incorporated.

- E. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation-Construction Systems.
 - b. Bostik, Inc.
 - c. Dow Corning Corporation.
 - d. GE Construction Sealants; Momentive Performance Materials Inc.
 - e. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - f. Pecora Corporation.
 - g. Polymeric Systems, Inc.
 - h. Schnee-Morehead, Inc., an ITW company.
 - i. Sika Corporation.
 - j. Tremco Incorporated.

- F. Glazing Compounds for Fire-rated Glazing Materials
 1. Glazing Compound: DAP 33 putty
 2. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension
 3. Grade NS; Class 25 with additional movement capability of 50 percent in both extension

and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:

- a. Dow Corning 795 - Dow Corning Corp.
- b. Silglaze-II 2800 - General Electric Co.
- c. Spectrem 2 - Tremco Inc

2.9 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- C. Fire-rated Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.

2.10 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Non-Fire Rated Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Fire-rated Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant where indicated.
- F. Center glass lites in openings on setting block and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape where indicated.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- B. Remove and replace glass that is damaged during construction period.
- C. Wash glass on both faces not more than 4 days prior to date scheduled for inspection intended to establish date of substantial completion in each area of the project. Wash glass with methods as recommended by glass manufacturer.

3.6 MONOLITHIC GLASS SCHEDULE

- A. Glass Type [GL-1]: Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Visible Light Transmittance: 88 percent minimum.
 - 3. Solar Heat Gain Coefficient: .84 maximum.
 - 4. Safety glazing required.
- B. Glass Type [GL-2]: Tinted fully tempered float glass.
 - 1. Basis-of-Design Product: AGC Glass Company North America; Solarshield.
 - 2. Tint Color: Solarshield Pure Grey
 - 3. Minimum Thickness: 6 mm.
 - 4. Visible Light Transmittance: 45 percent minimum.
 - 5. Solar Heat Gain Coefficient: .60 maximum.
 - 6. Safety glazing required.

3.7 INSULATING GLASS SCHEDULE

- A. Glass Type [IG-3]: Solarban 70 Tinted Low-E insulating glass.
 - 1. Basis-of-Design Product: Vitro Architectural Glass
 - 2. Overall Unit Thickness: 1 inch (25 mm).
 - 3. Minimum Thickness of Each Glass Lite: 6 mm.
 - 4. Outdoor Lite: Tinted fully tempered float glass.
 - 5. Tint Color: Solarshield Pure Grey, Bronze or Forest Green.
 - a. Color to be selected by Architect after Bid Date.
 - 6. Interspace Content: Air.
 - 7. Indoor Lite: Clear fully tempered float glass.
 - 8. Low-E Coating: Sputtered on second surface
 - 9. Winter Nighttime U-Factor: .25 maximum.
 - 10. Summer Daytime U-Factor: .25 maximum.

11. Visible Light Transmittance:
 - a. Pure Grey -36 percent minimum.
 - b. Bronze -39 percent minimum.
 - c. Forest Green -48 percent minimum.

12. Solar Heat Gain Coefficient:
 - a. Pure Grey -.25 maximum.
 - b. Bronze -.25 maximum.
 - c. Forest Green -.25 maximum.

13. Safety glazing required.

END OF SECTION

SECTION 09250 - GYPSUM DRYWALL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Types of work include:
 - 1. Gypsum drywall at walls and ceilings.
 - 2. Air Barrier
 - 3. Drywall finishing (joint tape-and-compound treatment).

1.3 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where gypsum drywall systems with fire- resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories acceptable to authorities having jurisdiction.
 - 1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No.'s. in GA "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.
- B. Gypsum Board Terminology Standard: GA-505 by Gypsum Association.
- C. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store material inside under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements, General: Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum board.
- B. Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F maintain continuous, uniform, comfortable building working temperatures of not less than 55 degrees F for a minimum period of 48 hours prior to, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
- C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Gypsum Board and Related Products:
 - a. Georgia-Pacific Corp.
 - b. Gold Bond Building Products Div., National Gypsum Co.
 - c. United States Gypsum Co.
 - d. CertainTeed Corporation
 - e. Lafarge North America
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Gypsum Wallboard: ASTM C 36, of types, edge configuration and thickness indicated below; in maximum lengths available to minimize end-to-end butt joints.
 - 1. Provide Type "X" fire-resistant at all locations unless otherwise where identified by a UL Listing or Classification or as denoted on the drawings.
 - 2. Provide Type "MR" moisture resistant, where gypsum board is shown at all wet areas (Restrooms, etc.) install 5/8" moisture resistant gypsum board at all wet walls where plumbing fixtures are shown.
 - 3. Thickness: 5/8" unless otherwise indicated.
 - 4. Edges: Manufacturer's standard.
- B. Air Barrier: (Where indicated and/or identified on the drawings)
 - 1. At the bottom of the wood trusses the Contractor shall furnish and install the following materials:
 - a. Gypsum board having a thickness of not less than 1/2 inch (12 mm). Seal **all** joints with insulation tape.

2.3 TRIM ACCESSORIES

- A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.
- B. Non-Beaded Trim: Non-beaded trim shall not be used, except with specific approval by the Architect.

2.4 JOINT TREATMENT MATERIALS

- A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
- B. Joint Tape: Paper reinforcing tape.
- C. Joint Compound: Ready-mixed vinyl-type for interior use.
 - 1. Grade: A single multi-purpose grade, for entire application.

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

- B. Gypsum Board Screws: Comply with ASTM C 646.
- C. Gypsum Board Nails: Comply with ASTM C 514.
- D. Concealed Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable sealant for concealed applications per ASTM C 919.
- E. Exposed Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable sealant for exposed applications per ASTM C 919.
- F. Water-Resistant Adhesive: Type I organic adhesive for ceramic tile complying with ANSI A136.1.

PART 3 - EXECUTION

3.1 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA 216.
- B. Locate exposed end-butt joints as far from center of walls possible, and stagger not less than 1'-0" in alternate courses of board.
- C. Install wall/partition boards vertically to avoid end-butt joints wherever possible.
- D. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
- E. Locate all edge and end joints over supports. Stagger vertical joints over different studs on opposite sides of partitions.
- F. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- G. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.
- H. Cover both faces of stud framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.
 - 1. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area and may be limited to not less than 75% of full coverage.
- I. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant.
- J. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.2 METHODS OF GYPSUM DRYWALL APPLICATION

- A. Single-Layer Application: Install gypsum wallboard.
- B. On partitions/walls apply gypsum board vertically unless otherwise indicated and provide sheet lengths which will minimize end joints.

3.3 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or

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sealant-filled (including expansion joints).

- D. Install semi-finishing trim where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive trim with face flanges covered with joint compound.
- E. Provide control joints horizontally and/or vertically at no less than 24'-0" o.c. max. Refer to plans for specific location or installed as directed by Architect.
- F. Install H-molding in exterior gypsum drywall work where control joints are indicated.

3.4 FINISHING OF DRYWALL

- A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, if any, using type of compound recommended by manufacturer.
 - 1. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
 - 2. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.
 - 3. Tape and finish gypsum board in accordance with ASTM C 840, GA 214 and GA 216.
 - 4. Provide joint, fastener depression, and corner treatment. Do not use fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer.
 - 5. Where gypsum surfaces are to be finished to Level 5 in accordance with GA 214, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.
 - 6. **All Exposed gypsum board surfaces** shall be finished to a minimum **Level 4** in accordance with GA 214.
 - 7. Where gypsum board is to receive eggshell, semi-gloss or gloss paint finish, or where severe, up or down lighting conditions occur, shall be finished to **Level 5** in accordance to GA 214 Level 5, unless indicated otherwise.
 - 8. All gypsum board surfaces at **all Corridors** shall be finished to **Level 5** in accordance to GA 214 Level 5.
 - 9. **All gypsum board surfaces at all Classrooms shall be finished to Level 4 in accordance to GA 214.**
 - 10. Plenum areas above ceilings shall be finished to **Level 1** in accordance with GA 214.
 - 11. Water resistant gypsum backing board, ASTM C 630/C 630M, to receive ceramic tile shall be finished to **Level 2** in accordance with GA 214.
 - 12. Walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting shall be finished to **Level 3** in accordance with GA 214.
- B. Partial Finishing: Omit third coat and sanding on concealed drywall work which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.
- C. Refer to section on painting in Division 9 for decorative finishes to be applied to drywall work.

3.5 PROTECTION OF WORK

- A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION

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SECTION 09301 - PORCELAIN TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Definition: Tile includes ceramic surfacing units made from clay or other ceramic materials.
- B. Extent of tile work is indicated on drawings and schedules.
- C. Types of tile work in this section include the following:
 - 1. Floor Tile.
 - 2. Wainscot Accent Tile.
 - 3. Wainscot Tile Cap.
 - 4. Base.
- D. Portland cement plaster scratch coat on wall surfaces indicated to receive tile is work of this section.
- E. Sealing expansion and other joints in tile work with elastomeric joint sealers is work of this section.

1.3 QUALITY ASSURANCE

- A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.
- B. Mock-Up: Contractor shall provide mock-up panels for evaluation of materials, surface preparation techniques and application workmanship.
 - 1. Mock-up panel shall be no less than 4'-0" x 4'-0" panel as follows:
 - a. One (1) panel per room, per surface. (i.e. 1 panel for wall surface and 1 panel for floor surface for each room of different selection).
 - b. Mock-up panels shall be marked identifying room location and product manufacturer, type, style, size and color information.
 - c. Do not proceed with work until materials, workmanship, color, and sheen are approved by Architect.
 - d. Provide additional mock-up panels as required to produce acceptable work.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.
- B. Samples for Selection Purposes: Submit manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection.

1.5 PRODUCT HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- C. Maintain temperatures at not less than 50 degrees F in tiled areas during installation and for 7 days after completion, unless higher temperatures required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Porcelain Tile:
 - a. StonePeak (Basis of Design)
 - b. American Olean Tile Co.
 - c. Marazzi
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.
 - 1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with installation products and materials indicated.
- C. Colors, Textures and Patterns: For tile and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standards.
 - 1. Provide tile trim and accessories which match color and finish of adjoining flat tile.
- D. Mounting: Where factory-mounted tile is required provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.
 - 1. Where tile is indicated for installation on exteriors or in wet areas, do not use back or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of use and has been successfully used on other projects.

2.3 TILE PRODUCTS

- A. Provide tile complying with the following requirements:
 - 1. Manufacturer/Series:
 - a. **StonePeak "Simply Modern" Collection.**
 - 2. Type:
 - a. Porcelain
 - 3. Wearing Surface for Floors:
 - a. "stable, firm and slip resistant", (exceeds 0.60 on the ASTM C-1028 test, wet and dry).
 - 4. Nominal Thickness:
 - a. 3/8"
 - 5. Nominal Facial Dimensions as follows:
 - a. Floor Tile
 - 1. **12" x 24" Floor Tile** - "Simply Modern" Series, Unglazed, with 1/4" grout joints.

2. **Shower Floors: 12" x 24" Floor Tile** "Simply Modern" Series, (Field Cut to Square size as required for sloped floor to drain)- Unglazed, with 1/4" grout joints.
- c. Base:
 1. **6" x 12" Coved Base** – "Schluter Dilex" Series.
- d. Wainscot Cap:
 1. **3" x 12" Bullnose** – "Simply Modern" Series.
6. Face: Plain with cushion edges.
- B. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
 1. Size:
 - a. As indicated, coordinated with sizes and coursing of adjoining flat tile, where applicable.
 2. Shapes:
 - a. Selected from manufacturer's standard shapes.
 3. External Corners for Portland Cement Mortar Installations:
 - a. Bullnose shape with a radius of not less than 3/4" unless otherwise indicated.
 4. Internal Corners:
 - a. Field-butt square corners, except use internal cove and cap angle pieces designed to member with stretcher shapes.

2.4 SETTING MATERIALS

- A. Portland Cement Mortar Installation Materials: Provide materials to comply with ANSI A108.1 as required for installation method designated, unless otherwise indicated.

2.5 GROUTING MATERIALS – FLOOR & WALL

- A. High Performance Epoxy grout that offers color uniformity, durability and stain resistance with extraordinary ease of use.
 1. Laticrete "Spectralock Pro Grout".
 2. Color to be selected by architect after the bid date from manufacturer standards
- B. Epoxy grout is to be installed per manufacturer's instructions.

2.6 MISCELLANEOUS MATERIALS

- A. Single-Component Sealants: ASTM C 920, Type S, Grade NS, use NT (for use in joints in non-traffic areas).
- B. Two-Component Sealants: ASTM C 920, Type M, Grade P, Class 25, use T (for use in joints subject to pedestrian traffic).
- C. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred St., Alexandria, VA 22134 or Ceramic Tile Institute, 700 N. Virgil Ave., Los Angeles, CA 90029.

2.7 TILE BACKING PANELS

- A. Fiber-Cement Backer Board: ASTM C1288, in maximum lengths available to minimize end-to-end butt joints.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.

- b. Custom Building Products.
 - c. James Hardie Building Products, Inc.
- 2. Thickness: 1/2 inch (12.7 mm) unless otherwise indicated on drawings.
- B. Install panels and treat joints in accordance with ANSI A108.11, APA guidelines, and manufacturer's written instructions for type of application indicated

2.8 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.2-mm) nominal thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Schluter Systems L.P.
 - b. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.
- C. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.2 PRE-INSTALLATION CONFERENCE

- A. A pre-installation conference is required before any tiling materials are installed. This conference shall be conducted by a representative of the Architect and attended by the General Contractor and Tile Contractor. Provide at least 72 hours advance notice to participants prior to convening pre-installation conference.
- B. The pre-installation conference is intended to clarify demolition and application requirements for work to be completed before tiling operations can begin. This would include a detailed review of the specifications, plans, finish schedules and approved shop drawings, submittal data, samples and mock-ups. If this pre-installation 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 tiling areas and substantial agreement on all requirements.
- C. The following are to be accomplished during the conference:
 - 1. To review all requirements listed in the specifications and resolve any questions or conflicts that may arise.
 - 2. To establish trade-related job schedules.
 - 3. To establish tiling schedule and work methods that will prevent progress of other trades.
 - 4. Require that all surface preparations and conditions be complete prior to installing tile work.
 - 5. To establish those areas on the job site that will be designated as work and storage areas for

tiling operations.

6. To establish acceptable methods of protecting the finished tile surfaces if any trades must travel across or work on, above or around any areas of the finished tile work.
- D. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-installation conference. This report shall be made a part of the project record and copies furnished to the General Contractor and the Owner.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Setting beds:
 1. Floor tile: Thinset.
 2. Wall tile: Thinset.
- D. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.
- F. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.
 1. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.
- G. Lay out tile wainscots to next full tile beyond dimensions indicated.
- H. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated, or if not indicated, at spacing and locations recommended in TCA "Handbook for Ceramic Tile Installation", and approved by Architect.
 1. Prepare joints and apply sealants to comply with requirements of referenced standards and sealant manufacturer.
- I. Grout tile to comply with referenced installation standards, using grout materials indicated.

3.4 FLOOR INSTALLATION METHODS

- A. Porcelain Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:
 1. Concrete Subfloors, Interior: TCA F113 with isolation membrane equal to Nobleseal CIS.
- B. Grout:
 1. High Performance Epoxy grout is to be installed per manufacturer's instructions.
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.
- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood or other flooring which finishes flush with top of tile.

3.5 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Unglazed tile shall be cleaned with non-acid solutions only recommended by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of tile cleaning. Flush surface with clean water after cleaning.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.
- C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.
- D. Prohibit foot and wheel traffic from using tiled floors for at least 7 days after grouting is completed. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.6 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Tile Flooring: Furnish not less than one box for each type, color, pattern and size installed.

END OF SECTION

SECTION 09510 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Extent of acoustical ceilings specified in this section include the following:
 - 1. Acoustical lay-in panel ceilings in an exposed suspended metal grid system.

SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
 - 1. Full size sample of each acoustical panel type, pattern and color.
 - 2. Set of 12" long samples of exposed runners and moldings for each color and system type required.
- B. Certificates: Submit certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements.

1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84.
 - 2. Flame Spread: 25 or less.
 - 3. Smoke Developed: 50 or less.
- B. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
- C. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).
- D. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

- A. Space Enclosures: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete

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and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

USG Interiors, LLC. (Basis of Design) | www.usg.com | Ph: 1.800.950.3839

1. Certainteed Corporation | www.certainteed.com | Ph: 1.800.233.8990
2. Armstrong World Industries Inc. | www.armstrongceilings.com | Ph: 877.276.7876

- B. Equal products of other manufacturers may be used in the work provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 GENERAL ACOUSTICAL CEILING TILE UNITS

- A. Standard for Acoustical Ceiling Tile Units: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC' as applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).

1. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.

- B. Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).

- C. Colors, Textures and Patterns: Provide products to match appearance characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of quality designated.

2.3 ACOUSTICAL TILES

A. Acoustical Panel Type: Vinyl Covered Ceiling Panels

1. USG "Sheetrock Brand Clean Room Lay-In Gypsum Panels".
2. Classification: Provide ceiling panels complying with ASTM E 1264 for type, form and pattern as follows:
 - a. Type XX, mineral based with membrane faced overlay. Vinyl face, back and sides covered gypsum ceiling panels.
 - b. Form: Not Applicable
 - c. Pattern: Smooth
3. Color: Flat White 050.
4. LR: Not less than 0.77
5. NRC: Not less than: N/A
6. CAC: Not less than 35
7. Edge / Joint Detail:
 - a. Square (Typical if not indicated on drawings).
 - b. SLT Beveled Reveal (Only if indicated on drawings).
8. Panel Thickness: 1/2 inch (12.7 mm).

9. Modular Size: 24 by 24 inches (610 by 610 mm).
10. Recycled Content: 80%.
11. Panel Features: Washable, scrubbable, soil and impact resistant finish. Meets USDA/FSIS guidelines for use in food processing areas.
12. Clean room performance: Acceptable in applications up to Class 100 Clean rooms.
13. ClimaPlus™ 30 year limited system warranty. Contains a broad spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew. Includes sag resistance performance.
14. Suspension Grid/Width: USG Donn ZXLA; 15/16”.

B. Acoustical Panel Type: Lay-In Acoustical Ceiling Panels

1. USG “Radar” Acoustical Panels
2. Classification: Provide ceiling panels complying with ASTM E 1264 for type, form and pattern as follows:
 - a. Type III, mineral base with painted finish
 - b. Form: 2, water felted.
 - c. Pattern: Perforated, small holes and light texture.
3. Color: Flat White 050.
4. LR: Not less than 0.84
5. NRC: Not less than 0.45
6. CAC: Not less than 33
7. Edge / Joint Detail:
 - a. SQ Square (Typical if not indicated on drawings).
 - b. SLT Beveled Reveal (Only if indicated on drawings).
8. Panel Thickness: 5/8 inch (15.8mm).
9. Modular Size: 24 by 24 inches (600 by 600 mm).
10. Recycled Content: Up to 59%.
11. Panel Features:
 - a. Biobased product that is USDA certified.
 - b. Abuse Resistant, high durability and can be cleaned easily with a soft brush & vacuummed.
12. ClimaPlus™ 30 year limited system warranty. Contains a broad spectrum antimicrobial additive on the face and back of the panel that provides resistance against the growth of mold and mildew. Includes sag resistance performance.
13. Suspension Grid/Width: USG Donn DX; 15/16” (24mm).

2.4 GENERAL METAL SUSPENSION SYSTEMS

- A. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable STM C 635 requirements.
- B. Finishes and Colors: Provide manufacturer's standard factory applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.
 1. White.

- C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.
- D. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at 3- times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.
- E. Edge Moldings and Trim: Formed steel section; exposed surfaces prefinished to match suspension system components.
 - 1. Provide shadow molding for edges equal to MS174; 9/16" thick exposed flange; 3/8" x 3/8" reveal; 7/8" vertical flange.
 - 2. At penetrations of ceiling install manufacturer's standard molding which fits with type of edge detail and suspension system indicated.
 - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- F. Hold-Down/Impact Clips: Where indicated provide manufacturer's standard impact clip system design to absorb impact forces against lay-in panels. Install hold down clips at all ceiling panels within 10'-0" of and exterior door.

2.5 METAL SUSPENSION SYSTEMS

A. USG Donn Brand ZXLA 15/16" Acoustical Suspension System

- 1. Double-web design; Intermediate Duty as defined by ASTM C635. Bottom face with 15/16" (24mm) exposed flange with pre-painted aluminum cap; cross tee holes and hanger wire holes at 6 in oc; integral reversible splices, commercial quality pretreated and painted, exposed surfaces prefinished in manufacturer's enhanced corrosion resistant polyester paint finish. Cross tees; roll-formed into double-web design with rectangular bulb; 15/16 (24mm) in exposed flange with pre-painted aluminum cap; Stainless Steel clips clenched to the web Main tees and cross tees shall be positively locked yet shall be removable without the use of tools.
- 2. Structural Classification: Intermediate Duty.
- 3. Tee Profile: 15/16" (24mm) wide.
- 4. Color: White

B. USG Donn Brand DX/DXL 15/16" Acoustical Suspension System

- 1. Narrow Face, Capped, Double Web, Cold Rolled Steel Suspension System: Main and Cross Tees as defined by ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish
- 2. Structural Classification: Intermediate Duty.
- 3. Tee Profile: Narrow Face 15/16" (22mm) wide.
- 4. Color: White

2.6 SEALANT

- A. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.
- B. Manufacturers: The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. BA-98; Pecora Corp.
 - 2. Tremco Acoustical Sealant; Tremco
 - 3. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to schedule bid opening.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Coordinate ceiling layout with lighting layout. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.2 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and CISCA standards applicable to work.
- B. Arrange acoustical units and orient directionally-patterned units (if any) in manner shown by reflected ceiling plans.
- C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members.
 - 1. Locate hangers within 6" inches from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
 - 2. Locate hangers on all 4 corners of the ceiling grid where a projector is installed
- D. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperature.
- E. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter-splaying or other equally effective means.
- F. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
- G. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.
- H. Screw-attached moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.
- I. Install acoustical panels in coordination with suspension system with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
- J. Install hold-down clips on panels, within 10'-0" of exterior door openings, where panels are other than horizontal, and in areas where required by governing regulations or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required.

3.3 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Ceiling Tile: Furnish not less than one box for each type, color, pattern and size installed.

END OF SECTION

SECTION 09551 – WOOD GYMNASIUM FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Wood flooring for basketball court.

1.3 QUALITY ASSURANCE

- A. Floor System Manufacturer Qualifications:
 - 1. Manufacturer shall be an established firm experienced in field.
 - 2. Manufacturers wishing to gain prior approval shall request, in writing, for owner's qualification criteria.
- B. Floor Contractor/Installer Qualifications and Certifications:
 - 1. Installer shall be a company exhibiting a minimum of ten (10) years continuous experience in the athletic flooring field and approved by the manufacturer.
 - 2. Submit a list of at least five completed projects of similar magnitude and complexity where this specific flooring system was installed. Include owner references with this submittal.

1.4 SUBMITTALS

- A. Manufacturer's Product Data:
 - 1. Submit three (3) copies of manufacturer's product data.
- B. Concrete Guidelines:
 - 1. Submit three (3) copies of MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.
- C. Samples:
 - 1. Submit one (1) floor sample. Sample to be made by the manufacturer and so indicated.
- D. Maintenance Literature:
 - 1. Submit Three (3) copies of MFMA-Care and Maintenance of Wood Floors Instructions.
- E. Certification:
 - 1. Suppliers shall submit certificates attesting that materials furnished will meet specifications for grade, quality, dryness and treatment.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials:
 - 1. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed.
 - 2. Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained. Ideal installation/storage conditions are the same as those that will prevail when building is occupied.
 - 3. Materials shall not be stored at the installation location if the moisture content of the concrete slab exceeds 4% or vapor transmission exceeds 4.5 pounds per 1,000 square feet (2.20 kg per 100 square meters).

1.6 JOB CONDITIONS

- A. Do not install floor system until concrete has been cured 60 days and the requirements above are obtained.
- B. The General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation.
- C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.
- D. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of gym, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete gymnasium floor.

1.7 WARRANTY

- A. Manufacturer hereby warrants the floor system material specified herein to be free from manufacturing defects for a period of (1) one year. This warranty is in lieu of all other warranties, expressed or implied, including but not limited to any warranty of merchantability or fitness for a particular purpose, and any
- B. Other obligation on the part of the manufacturer. In the event of the breach of any warranty, the liability of the manufacturer. shall be limited to repair or replacing the floor material and system components supplied by manufacturer and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Robbins, Inc. "BIO-CHANNEL SB (Basis of Design); www.robbinsfloor.com.
 - 2. Aacer Sports Flooring | 970 N. Ogden Road, Peshtigo, WI 54157 | Ph: 715.582.1181 | www.aacerflooring.com.
 - 3. Action Floor Systems LLC. | 4781 N. US Hwy. 51, Mercer, WI 54547 | Ph: 800.746.3512 | www.actionfloors.com.
 - 4. Connor Sports Flooring | 251 Industrial Drive, Amasa, MI | Ph. 630.641.9184 | www.connorsports.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Vapor Barrier Membrane:
 - 1. 6 mil polyethylene sheeting
- B. Robbins "BIO-CHANNEL SB resilient component:
 - 1. Resilient shock pad shall be "Zero/G Shock Pad. Pad shall be treated with Aegis Micro-Shield, Mold inhibitor component.
- C. Robbins " BIO-CHANNEL SB " subfloor system:
 - 1. Subfloor layer – 3/4" x 48" x 96" CDX plywood. Exterior grade, Fir or SYP. Panel shall be factory-routed and countersunk to receive channel-anchors supplied by manufacturer. Panel shall be factory-routed to receive the recessed Zero/G shock pad strips supplied by the manufacturer.
- D. Subfloor Fasteners:

1. Galvanized Steel channel anchors shall be furnished by manufacturer in size and design required to anchor subfloor securely to the concrete subfloor. Channel anchor bolts to be furnished by manufacturer to secure the channel anchor to the substrate.
- E. Flooring Fasteners:
1. Powercleats or staples or equal floor cleats or staples, as recommended by the manufacturer.
- F. Maple Flooring:
1. 25/32 x 2-1/4, random length, 2&Btr., XLplus Maple Strip. Maple shall be graded in accordance with MFMA-FJ grade rules. All flooring to be tongue & grooved, end-matched and kiln-dried. Straight-lay pattern.
- G. Perimeter Base:
1. Robbins Inc. 3" x 4" Vent-Cove. Color shall be Black.
- H. Finishing material:
1. Bona. "All-Court" Seal or MFMA approved equal.
 2. Bona. "All-Court" Finish or MFMA approved equal.
 3. Bona SuperSport gameline paint in standard colors as selected by the Owner.
- I. Expansion joint cover:
1. Where required at edge of all wood and concrete install Pemko 271-A expansion cover, or equal. Cover
 2. to be 5" width in color specified by architect. Equal approved by the flooring manufacturer may also be used.
- J. ADA Ramps:
1. All doors to receive code-compliant non-slip ramp – Safepath Products, Model MRED 800.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Following demolition of existing gym flooring, inspect existing concrete slab for proper tolerance and dryness and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8" (3mm) in a 10' (3m). Moisture content of the concrete slab shall not exceed 4% or vapor transmission exceeds 4.5 pounds per 1,000 square feet (2.20 kg per 100 square meters).
- B. Concrete subfloors must be prepared and in acceptable condition for new wood flooring.
- C. Concrete subfloor shall be free of all equipment and broom cleaned.
- D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

3.2 INSTALLATION

- A. "Bio-Channel SB" flooring system:
 1. Install polyethylene with joints lapped a minimum four inches (4").
 2. Install "Zero/G" pad on over entire subfloor. Tape edges to prevent curling.
 3. Position plywood panels per manufacturer's latest guidelines. Stagger all joints and space panels 1/4" apart.
 4. Place Channel Anchor in each designated pre-routed slot and fasten with provided channel anchor bolts.

5. Machine nail maple flooring to plywood subfloor straight lay pattern. All end joints shall be driven up tightly and proper spacing allowed for humidity changes affecting the floor.
6. Flooring contractor shall be allowed to incorporate spacer joints in the floor to insure adequate expansion and to adjust for pattern creep.
7. Provide 2" expansion voids at all walls and vertical obstructions.

B. Blocking:

1. Prior to installation of new gym flooring, General Contractor is to coordinate the installation of any necessary solid blocking at doorways, under bleachers and below goals for install of bleachers and/or gym equipment. Install Bleacher Blocking per manufacturer's recommendations.

C. Sanding:

1. Sand per manufacturer's recommendations.
2. Sand floor using coarse, medium, and fine paper. After sanding, run 100 grit screen over entire floor with rotary sander.
3. Clean floor to remove all dust and debris prior to sealing wood.

D. Finishing:

1. Apply two coats of gym sealer and two coats of gym finish.
2. Gamelines shall be placed on floor between seal and finish coats.
3. Comply with all local sports jurisdictions when applying lines
4. Gamelines to consist of AHSAA approved basketball court as indicated on the drawings.
5. Color shall be selected by the Architect from standard colors. See Floor plan for special game lines and graphics to be applied to the floor.

E. Perimeter molding:

1. Install vented cove-base at all walls with screws or adhesive. Use pre-formed outside corners and neatly miter all inside corners.
2. Install ADA ramps at all doors using manufacturer's guidelines and recommendation.
3. Install expansion joint cover where required at edge of all wood flooring to cover expansion spacing in the floor.

3.3 CLEANING

- A. Clean up all unused materials and debris and remove it from the premises.

END OF SECTION

SECTION 09624 – SYNTHETIC SPORT FLOORING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Scope
 - 1. The complete installation of Synthetic Sports Flooring System product including adhesive and rubber flooring.
- B. Related Work Specified Under Other Sections:
 - 1. Substrate Buildup:
 - a. Concrete for indoor installation.....Section 03300
 - 2. Slab Depression:
 - a. Depression shall be thickness of Galaxy XTreme material – 1”.
 - 3. Slab Tolerance
 - a. Slab tolerance is (+/-) 1/8" in radius of 10'. Surface steel troweled.
 - b. NO CURING AGENTS OR SEALERS ARE TO BE APPLIED TO THE CONCRETE SLAB.
 - 4. Membrane Waterproofing and Dampproofing.....Section 07100
 - a. Concrete subfloors on or below grade shall be adequately waterproofed beneath and at the perimeter of the slab and on the earth side of below-grade walls.
 - 5. Thresholds-Metal.....Section 08700
 - 6. Game Standard Inserts.....Section 11500

1.3 QUALITY ASSURANCE

- A. Floor System Manufacturer Qualifications
 - 1. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years.
- B. Floor Contractor/Installer Qualifications
 - 1. Flooring contractor shall be experienced in the flooring field and approved by manufacturer.
 - 2. Flooring contractor shall be factory-approved and have completed at least three projects of similar magnitude and complexity.

1.4 SUBMITTALS

- A. Manufacturer's Product Data: Submit three (3) copies of Synthetic Sports Floor System guide specifications.
- B. Samples: Submit one (1) sample of manufacturer's color selections.
- C. Maintenance Literature: Submit three (3) copies of maintenance instructions.

1.5 DELIVERY AND STORAGE

- A. Delivery of Materials
 - 1. Material shall not be delivered or installed until all masonry, painting, plastering, tile work, marble and terrazzo work are complete and all overhead mechanical work, lighting, backstops, and scoreboards are installed. Room temperature shall be at least 55 degrees Fahrenheit, and ambient relative humidity shall be 75% or less. Vapor emission of concrete

SYNTHETIC SPORT FLOOR SYSTEM

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slab shall be 4.0 pounds per 1,000 square feet or less as tested with calcium chloride test(s), and in-slab relative humidity shall be 75% or less.

2. Store material in a protected area on site in a controlled environment a minimum of 48 hours prior to installation. (Extreme cold or hot climate may require additional time.) Area where materials are to be stored should be maintained at 55 degrees Fahrenheit and under 75% relative humidity by the General Contractor.

1.6 JOB CONDITIONS

A. Schedule of Installation

1. Do not install floor system until concrete has been cured sixty (60) days, and the conditions in Description and Quality Assurance of this specification are obtained.
2. Environmental temperatures of area in which material will be stored and installed must remain at occupancy conditions during and after installation.
3. Do not install Synthetic Sport Floor System until all other trades are completed.
4. After Synthetic Sport Floor System is installed and game lines are painted, area is to be locked by general contractor to allow curing time for the paint and adhesive. No other trades are to be allowed on floor until it is accepted in writing by owner or owner's authorized agent.

1.7 GUARANTEE

- A. Manufacturer shall warrant the Synthetic Sport Floor System material to be free from manufacturing defects for a period of one (1) year.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 1. Robbins, Inc. Galaxy XTreme Sport Surface System (Basis of Design); www.robbinsfloor.com.
 2. Ecore International, 715 Fountain Ave., Lancaster, PA 17601; Phone: 866.795.2732
 3. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Surface shall be rubber tiles 1" x 24" x 24". Material shall be a factory molded tile consisting of 100% recycled SBR rubber backing and either recycled SBR or EPDM wear layer. Waffle bottom design for shock absorption, impact absorption, drainage and cable routing.
- B. Typical physical properties of Galaxy XTreme
 1. Density ASTM D3676(top layer) 65 pcf-80pcf (depends on surface color)
 2. Shore A Hardness ASTM D2240 65 +/- 5
 3. Co-efficient of Friction ASTM D2047 >.95
 4. Tear Strength ASTM D624 70 PLI (min)
 5. Elongation ASTM D412 >150%
 6. Tensile Strength ASTM D412 >200 PSI
 7. Resistance to Chemicals ASTM F925 No Change
 8. Impact Insulation Class (IIC) E492 >50
 9. Critical Radiant Flux ASTM E648 Class II

10. LEED Qualifications

Qualifies for Material and Resources Credit

C. 18 lbs per tile

D. Manufactured in the USA

PART 3 - EXECUTION

3.1 INSTALLATION

A. **Galaxy XTreme** Rubber tile flooring.

1. Product can be loose laid indoors over a compacted base or existing floor covering using the interlocking molded dowel pin system.
2. Each tile contains six (6) barbed dowels to secure the tile in place
3. Dowels are inserted into factory molded dowel holes and the tiles are driven together using a wooden block or mallet.

B. Perimeter molding: Install a rubber base, anchored to walls with base cement.

3.2 CLEANING

A. Clean up all unused materials and debris and remove from the premises. Dispose of empty containers in accordance with federal and local regulations.

3.3 PROTECTION

A. Cure Time

1. No traffic or other trades shall be allowed on the surface for a period of one week following completion to allow for complete and proper cure of the finish.

B. Other Trades

1. It shall be the responsibility of the general contractor to protect the surface from damage by other trades before acceptance by the owner or the owner's authorized agent.

C. Safety

1. No smoking, open flames or sparks from electrical equipment or any other source shall be permitted during the installation process, or in areas where materials are stored

END OF SECTION

SECTION 09650 – RUBBER BASE, STAIR TREAD, RISER AND STRINGER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient Rubber Base
 - 2. Resilient Rubber Stair Tread with Riser.
 - 3. Resilient Rubber Stair Stringer.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Mockups: Provide resilient products with mockups specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by Johnsonite, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.6 PROJECT CONDITIONS

- A. Install resilient products after other finishing operations, including painting, have been completed.
- B. Maintain ambient temperatures within range recommended by Johnsonite, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by Johnsonite, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 2 - PRODUCTS

2.1 MANUFACTURERES

The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

- 1. Tarkett USA Inc. (Basis of Design; 30000 Aurora Road, Solon, OH 44139; 800.899.8916; www.tarkettna.com).
- 2. Mannington Commercial, 1844 U.S. Highway 41 S.E. Calhoun, GA 30701; PH: 800.241.2262; www.manningtoncommercial.com.

3. Roppe Corporation, U.S.A.; 1602 North Union Street, Fostoria, Ohio 44830-1158; Ph: 1.800.537.9527 or 419.435.8546; www.roppe.com.
4. Flexco Corporation; 1401 East 6th Street, Tusculumbia, AL 35674; PH: 800.633.315; www.flexcofloors.com.
5. Armstrong Flooring Commercial; 2500 Columbia Avenue, Lancaster, PA 17604; Ph:1.888.276.7876; www.armstrongflooring.com/commercial.

2.2 MATERIALS – RUBBER BASE

- A. Material Physical Characteristics: Provide rubber base complying with FS SS-W-40, Type II, with matching end stops and pre-formed or molded corner units and as follows:
 1. Manufactured from a proprietary thermoplastic rubber formulation.
 2. Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP, Group 1.
 3. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
 4. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
 5. Flexibility: Does not crack, break, or show any signs of fatigue when bent around a 1 1/4" diameter cylinder when tested according to ASTM F 137 Standard Test Method for Flexibility of Resilient Flooring Materials protocols.
 6. Color Stability: Meets or exceeds ASTM F 1861 requirements for color stability when tested to ASTM F 1515 Standard Test Method for Measuring Light Stability of Resilient Flooring protocols.
- B. RUBBER WALL BASE:
 1. Height: 4"
 2. Thickness: 1/8"
 3. Style: Standard Top-Set Cove
 4. Finish: Matte
 5. Colors and Patterns: As selected by Architect from manufacturer's standards after the bid.

2.3 MATERIALS - RUBBER INTEGRATED STAIR TREAD WITH RISER:

- A. Material Physical Characteristics:
 1. Manufactured from a homogeneous composition of 100% synthetic rubber.
 2. Complies with requirements for ASTM F 2169 Standard Specification for Resilient Stair Treads, Type TS, Class 1 and 2, Group 1 and 2.
 3. Hardness: ASTM D 2240 – Not less than 85 Shore A.
 4. Abrasion Resistance: ASTM D 3389 – less than 1 gram weight loss.
 5. ASTM D 2047, Standard Test Method for Static Coefficient of Friction of Polish- Coated Flooring of 0.6 or greater.
 6. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
 7. Integrated tread and riser.
 8. Visually Impaired treads meet ADA and are California Title 24 Accessibility requirements.
 9. Visually Impaired treads will have 2" wide co-extruded contrasting color insert or 2" wide contrasting color grit tape insert.

B. RUBBER INTEGRATED STAIR TREAD WITH RISER:

1. Visually Impaired Solid Color Rubber Integrated Stair Tread and Riser with Contrasting Color Insert
 - a. For Raised Round surface, solid color integrated stair tread and riser, 2" height hinged Square Nose, tapering .210" to .113", with 2" contrasting color grit tape insert.
 - b. Color to be selected by Architect after the bid date.
 - c. Round Pattern
2. Visually Impaired Solid Color Rubber Integrated Stair Tread and Riser with Contrasting Color Insert
 - a. Fast Lane surface, solid color integrated stair tread and riser, 2" height hinged Square Nose, tapering .210" to .113", with 2" contrasting color grit tape insert.
 - b. Color to be selected by Architect after the bid date.
 - c. Fast Lane Pattern.

2.4 MATERIALS - RESILIENT RUBBER STAIR STRINGER

A. Material Physical Characteristics:

1. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm² or greater, Class I.
2. Meets or exceeds the performance requirements for resistance to heat/light aging, chemicals, and dimensional stability when tested to the methods, as described, in ASTM F-1861.
3. Flexibility: Will not crack, break, or show any signs of fatigue when bent around a 1/4" (6.35 mm) diameter cylinder.

B. RUBBER STAIR STRINGER:

1. Rubber Stringers are manufactured from a proprietary thermoplastic rubber formulation designed specifically to meet the performance and dimensional requirements of ASTM F-1861, Type TP, Group 1 (solid) Standard Specification for Resilient Wall Base.
 - a. Thickness of 0.080" (2mm)
 - b. 10" (25.4 cm) height x 6 ft. (1.83 cm) long.
 - c. Color to be selected by Architect after the bid date.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based formulation manufactured and warranted by a reputable manufacturer.
 1. Flooring and Tread Adhesives: Premium, Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
- B. Stair Tread and Nose Filler: Two-Part Epoxy Caulking Compound to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
 - 4. Prepare Substrates according to ASTM F 710 including the following:
 - a. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 1) Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
 - or –
 - 2) Perform relative humidity test using in situ probes, ASTM F 2170. Must not exceed 80%.
 - b. A pH test for alkalinity must be conducted. Results should range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.
 - c. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 5. Wood steps/substrates:
 - a. The substrate must be rigid, free of movement.
 - b. Single wood and tongue and groove substrate should be covered with 1/4" (6.4 mm) or 1/2" (12.7 mm) APA approved underlayment plywood.
 - 1) Use 1/4" (6.4 mm) thick underlayment panels for boards with a face width of 3" (76 mm) or less.
 - 2) Use 1/2" (12.7 mm) thick underlayment panels for boards with a face width wider than 3" (76 mm).
 - c. Do not install over OSB (Oriented Strand Board), particle board, chipboard, lauan or composite type underlayments.
- B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Floor covering shall not be installed over expansion joints.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

- 3.3** Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.4 INSTALLATION – RUBBER BASE

- A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or

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areas where base is required.

- B. Install base in lengths as long as practicable without stretching base.
- C. Install base at outside corners using preformed corner units. If preformed unit is not available, then fabricate outside corners from base material utilizing a "V" shape top-set or pull-type gouge tool to make a shallow V-shape notch on back-side of wall base. Field-fabricated outside corners must have a minimum return length around each corner of 3 feet. Adhere to corner of walls so that no "whitening" (discoloration of base material) occurs at the bends.
- D. Install base at inside corners using preformed corner units or fabricated from base materials with mitered or coped inside corners.
- E. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
 - 1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- F. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.5 INSTALLATION - RESILIENT STAIR TREAD AND RISER

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Tread and Nosing:
 - 1. Use manufacturer Epoxy Caulking Compound to strengthen nosing and fill irregularities in substrates to conform to tread nosing.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.4 INSTALLATION - RESILIENT RUBBER STAIR STRINGER

- A. Comply with manufacturer's written instructions for installing resilient accessories.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

SECTION 09651 – LUXURY VINYL TILE FLOORING (LVT)

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Luxury Vinyl Tile flooring and accessories as indicated on drawings and in schedules.

1.2 RELATED REQUIREMENTS

- A. Section 09650 – Rubber Base.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of Luxury Vinyl Tile flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants and leveling compounds.
 - 1. Wherever possible, provide required Luxury Vinyl Tile flooring and accessories produced by a single manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit 2 copies of manufacturer's technical data and installation instructions for each type of Luxury Vinyl Tile flooring and accessory.
- B. Samples: Submit, for verification purposes, samples of each type, color, and pattern of Luxury Vinyl Tile, including accessories, required, indicating full range of color and pattern variation.

1.5 JOB CONDITIONS

- A. Store Luxury Vinyl Tile flooring products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by the manufacture, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- B. Maintain minimum temperature of 65°F in spaces to receive Luxury Vinyl Plank Tile flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store Luxury Vinyl Tile materials in spaces where they will be installed for at least 48 hours before beginning installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range recommended by the manufacture but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- E. Install Luxury Vinyl Tile flooring and accessories after other finishing operations, including painting, have been completed. Do not install Luxury Vinyl Tile Flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Mannington Commercial, 1844 U.S. Highway 41 S.E. Calhoun, GA 30701; PH: 800.241.2262; www.manningtoncommercial.com.
 - 2. Patcraft ; P.O. Box 2128, Dalton, GA 30722; PH: 334.462.9547; www.patcraft.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. LVT: "Spacia" Collection; "Abstract" Series

1. Construction High Performance Luxury Vinyl Tile flooring
 2. Class / ASTM F 1700 Class III Printed Film Vinyl Tile, Type B (embossed)
 3. Wear layer Thickness 20 mil or 0.020" (0.5 mm) Quantum Guard Elite
 4. Overall Thickness 4.0 mm or nominal
 5. Nominal Dimensions: 4" wide x 36" long
 6. Backing Class Commercial Grade
 7. Installation Glue Down
 8. Slip Resistance / ASTM D 2047 >0.65 (wet/dry)
 9. Warranty: 15 year limited commercial wear warranty.
 10. Colors as selected by the Owner.
- B. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- C. Leveling Compound: ProSpec Feather Edge, premium, polymer modified, rapid setting, trowelable underlayment that results in a very smooth, ultra thin finish or as recommended by the flooring manufacture.
- D. Surfaces must be solid, completely clean, free of oil, gypsum compounds, wax, grease, sealers, curing compounds, asphalt, paint, dirt, loose surface material and any contaminants that act as a bond breaker. Weak concrete surfaces must be cleaned down to solid sound concrete by mechanical means. Acid etching or chemical cleaning is not acceptable. Remove all dirt by vacuuming. All subfloors must be clean, dry and at least 40° F (4° C) prior to applying ProSpec Feather Edge.
- E. Installation: ProSpec Feather Edge will accept standard floor coverings such as VCT, vinyl sheet goods, tile and carpeting in approximately 15-30 minutes after placement.
- F. Materials: Extruded rubber accessories as required (i.e. nosings, reducer strip.)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufactures written instructions to ensure adhesion of Luxury Vinyl Tile Flooring.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
 4. Prepare Substrates according to ASTM F 710 including the following:
 - a. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation

only after substrates pass testing.

- i. Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
- or**
- ii. Perform relative humidity test using in situ probes, ASTM F 2170. Results must not exceed 80%.
- b. A pH test for alkalinity must be conducted. Results should range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.
 - c. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
- B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
 - C. Floor covering shall not be installed over expansion joints.
 - D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient tile flooring.
 1. Install with manufacturer's adhesive specified for the site conditions and follow adhesive label for proper use.
 2. Follow manufacturer's recommendation and lay tiles so graining follows the same direction.
 3. Roll the flooring in both directions using a 100 pound three-section roller.
- B. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, from wall to wall and under all casework or other fixed equipment. Where construction joints in concrete slab occur, lay tile joint with construction joint.
- C. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.
 1. Lay each color of tile with grain running in basket weave pattern.
- D. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.
- E. Accessories: Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
 1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- F. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- E. Cover resilient products until Substantial Completion.
- F. Wait 72 hours after installation before performing initial cleaning.
- G. A regular maintenance program must be started after the initial cleaning.

3.5 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Flooring: Furnish not less than one box for each type, color, pattern and size installed.

END OF SECTION

SECTION 09660 – RUBBERIZED SPORTS FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Provide all rubber flooring and adhesive as indicated and scheduled on the specifications including but not limited to the following:

1. Rubber Tile Flooring
2. Substrate Preparation

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications:

1. Provide resilient flooring materials manufactured in the United States of America by a firm with a minimum of 10 years' experience with resilient flooring materials of type equivalent to those specified.
2. Provide resilient flooring products, including wall base, accessories and subfloor preparation products from one manufacturer to ensure color matching and compatibility.
3. Manufacturer shall be capable of providing technical training and technical field service representation.

- B. Installer Qualifications:

1. Installer must be professional, licensed, insured and acceptable to manufacturer of resilient flooring materials. Installer must be certified in writing by floor manufacturer as qualified for installation of flooring system.
2. Project Managers or Field Supervisors must be INSTALL (International Standards & Training Alliance) certified CFI (Certified Floorcovering Installers) Certified and/or an FCICA (The Flooring Contractors Association) CIM (Certified Installation Manager) for the requirements of the project.

1.4 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures.
- B. Product Data: Submit manufacturer's technical data sheet, care & maintenance document, and warranty for each material and accessory proposed for use.
- C. Samples for Initial Selection Purposes: Submit manufacturer's standard color charts in form of actual selections of flooring, including accessories, showing full range of colors and patterns available, for each type of flooring required.
 1. Full size samples
 2. Other materials as requested.
- D. Maintenance Instructions: Submit two copies of manufacturer's recommended maintenance practices for each type of flooring and accessory required.

1.5 PROJECT CONDITIONS

- A. Install Rubber Tile after other finishing operations, including painting, have been completed.
- B. Maintain temperature at service levels and/or the ambient temperature must remain steady ($\pm 10^{\circ}$ F) between 65° F and 85° F for at least 48-hours prior to, during and until substantial completion.

RUBBER SPORTS FLOORING
09660-1

New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

MCKEE PROJECT NO. 24.169

- C. Maintain relative humidity at service levels, or between 40% and 65% RH. Avoid conditions in which dew point causes condensation on the installation surface.
- D. Do not install flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by flooring manufacturer's recommended bond and moisture test.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Roppe Corporation | www.roppe.com | 1602 N Union St. | Fostoria, OH 44830 | P: (800) 537-9527
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 PRODUCTS

A. TUFLEX RECYCLED RUBBER TILE FLOORING

- 1. Style: Tuflex Spartus.
- 2. Color: To be selected by Architect from "Spartus" Premium colors including selection from "Titan" standard colors.
- 3. Dimensions: Square Edge: 27" x 27" x 3/8" (9mm).
- 4. Thickness: 3/8" (9 mm)
- 5. Surface Finish: Smooth
- 6. ASTM D2047, Static Coefficient of Friction; > 0.8
- 7. ASTM F648/NFPA 253, Critical Radiant Flux; Class 1, > 0.45 W/cm²
- 8. ASTM F970, Static Load Limit; Passes 250 PSI
- 9. ASTM F970, Modified Static Load Limit; Passes 1,000 PSI
- 10. ASTM E492, Acoustical (Impact Insulation Class) Impact; IIC 52 (6" concrete, no drop ceiling), 67 IIC (6" concrete, with drop ceiling).
- 11. ASTM E90, Acoustical (Sound Transmission Class) STC 52 (6" concrete, no drop ceiling), STC 63 (6" concrete, with drop ceiling)
- 12. ASTM E2179, Effectiveness of Floor Covering; ΔIIC 22
- 13. Tuflex Recycled Rubber Tile is free of PVC
- 14. Shall comply with IBC Section 804.4.

B. INSTALLATION AND MAINTENANCE MATERIALS

- 1. Moisture Mitigation: Moisture testing is required for all Tuflex Recycled Rubber Tile installations. Mitigation should be performed if results indicate high levels of moisture. Recommended Moisture Mitigation Product:
 - a. Excelsior MM-100, Moisture Mitigation provided by Roppe
 - i. Unit Size: 2.5 Gallons
 - ii. Coverage: 1000 square feet per unit with one coat
 - iii. MM-100 is a water, solvent and VOC free, polyurethane-based moisture mitigation product used to treat concrete slabs with excessive moisture levels beyond what flooring adhesives allow.

- iv. MM-100 can block moisture up to 20 lbs. MVER or 99% RH.
 - v. MM-100 is a single component product, eliminating extensive mix times and concerns regarding pot life.
 - vi. MM-100 does not require aggressive concrete preparation, such as shotblasting or diamond grinding.
 - vii. MM-100 is not recommended as a moisture mitigation system over a non-porous substrate. The substrate should be porous as per ASTM F3191 with 90% of the original substrate exposed.
 - viii. MM-100 is a two coat system that is incredibly easy to apply and does not require any specialized equipment, its excellent coverage rates also make it incredibly cost effective.
 - ix. Despite being a two coat system, MM-100 is incredibly fast drying.
 - x. Flooring or subsequent coatings can be installed in less than two hours.
 - xi. Backed by a 10 year material and labor warranty, MM-100 is a fast and easy solution for the moisture issues that commonly plague flooring installations.
2. Substrate Preparation Products: Substrates should be prepared to properly receive the resilient flooring products being specified. Trowelable leveling and patching compounds that are latex-modified, Portland cement based or blended hydraulic cement based formulation. Recommended Substrate Preparation Products:
- a. Excelsior NP-230, Non-Porous Substrate Primer provided by Roppe
 - i. Unit Size: 2.5 Gallons
 - ii. Coverage: 1000 Square Feet per unit with one coat
 - iii. Used over MM-100 to promote adhesion of cementitious materials
 - iv. Single component and fast drying to allow for quick and easy installation
 - v. Contains an aggregate to provide mechanical bond for cementitious materials
 - b. Excelsior CP-300, Cementitious Patch provided by Roppe
 - i. Unit Size: 10 lb. Pail
 - ii. Coverage: 33 Square Feet per unit @ 1/8"
 - iii. Doesn't require primer over porous substrates
 - iv. Install flooring in as little as 30 minutes
 - c. Excelsior SU-310, Self-Leveling Underlayment provided by Roppe
 - i. Unit Size: 50 lb. Bag
 - ii. 5500 PSI Compressive Strength after 28 days
 - iii. Install flooring within 12 hours
 - iv. Pumpable
3. Adhesives: Adhesives should be selected based on the site conditions and use of the space being installed. Recommended Adhesive Products:
- a. Excelsior MS-700, Modified Silane Wet-Set Adhesive provided by Roppe
 - i. Unit Size: 3 Gallon
 - ii. Coverage: 480-705 Square Feet per unit
 - iii. Standard installations over porous and non-porous substrates
 - iv. Excellent green grab
 - v. Hard set adhesive adding to dimensionally stable materials

- vi. Excellent sheer strength
 - vii. Approved for Hill-Rom Beds
 - viii. Superior bond strength
 - ix. Great for environments with topical moisture
 - x. Great for exterior applications
 - xi. Installation Limits, Indoor Installations only
 - 1) 95% RH, ASTM F2170
 - 2) 10 lbs. MVER, ASTM F1869
- b. Excelsior EW-710, Epoxy Wet-Set Adhesive provided by Roppe
- i. Unit Size: 1 Gallon
 - ii. Coverage: 150 Square Feet per unit
 - iii. Standard installations over porous and non-porous substrates
 - iv. Excellent green grab
 - v. Hard set adhesive adding to dimensionally stable materials
 - vi. Excellent sheer strength
 - vii. Approved for Hill-Rom Beds
 - viii. Superior bond strength
 - ix. Great for environments with topical moisture
 - x. Great for exterior applications
 - xi. Installation Limits, Indoor Installations only
 - 1) 90% RH, ASTM F2170
 - 2) 6 lbs. MVER, ASTM F1869
 - 3) 7-10 pH
4. Maintenance Materials: Proper maintenance of the installation is critical to the long term performance of the flooring products being specified. Using the appropriate chemicals to maintain the product according to the environment in which it is specified is critical. Recommend maintenance products:
- a. Excelsior PF-960, Performance Finish provided by Roppe
 - i. For initial maintenance
 - b. Excelsior PF-900, All Purpose Neutral Cleaner
 - i. For initial and routine maintenance
5. Rubber Accessories: Provide and install the following as indicated and/or required for a complete installation:
- a. Edge strips/ Reducer Strips. Use edge/reducer strips where tile stops and the edge is exposed.

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide trained installers that are professional, licensed, insured and acceptable to manufacturer of resilient flooring materials.
- B. Ensure installers or installation teams meet one of the following requirements:

1. Have completed INSTALL (International Standards & Training Alliance) or CFI (Certified Floorcovering Installers) training programs and/or are certified by INSTALL or CFI.
2. Are being supervised by Project Managers or Field Supervisors that are INSTALL (International Standards & Training Alliance) certified.
3. CFI (Certified Floorcovering Installers) Certified and/or an FCICA (The Flooring Contractors Association) CIM (Certified Installation Manager).

3.2 EXAMINATION

- A. Verification of Conditions: Inspect all substrates to ensure they are clean, smooth, permanently dry, flat, and structurally sound. Confirm all areas are properly sealed and acclimated per manufacturer's requirements.
- B. Verification of Products: In accordance with manufacturer's installation requirements, visually inspect material for size, color or visual defects prior to installing. Any material that is incorrect or visually defective shall not be installed.

3.3 SUBSTRATE PREPARATION

- A. Preparation: Ensure substrate meets the requirements of ASTM F710 for concrete substrates and ASTM F1482 for wood substrates
 1. Substrates must be free of visible water or moisture, dust, sealers, paint, sweeping compounds, curing compounds, residual adhesives and adhesive removers, concrete hardeners or densifiers, solvents, wax, oil, grease, asphalt, visible alkaline salts or excessive efflorescence, mold, mildew and any other extraneous coating, film, material or foreign matter.
 2. It is recommended that all substrates have a floor flatness of FF32 and/or flatness tolerance of 1/8" in 6' or 3/16" in 10'.
 3. Acclimate all products to be used during the installation and the installation environment prior to installation according to the manufacturers written instructions

Concrete Substrates:

1. Moisture Testing: Perform moisture testing per the manufacturer's recommendations to determine conditions, it is recommended to treat new and existing slabs a little bit different to ensure adequate conditions exist for installation.
 - a. New Slabs on all grade levels: it is recommended to perform ASTM F2170 Relative Humidity testing no more than a week prior to installation too determine the levels present and when to proceed with the installation.
 - b. Existing Slabs on all grade levels: in addition to ASTM F2170 testing, existing slabs that have previously had floor covering installed, must be tested to ASTM F1869 Calcium Chloride test kits to determine the MVER of the concrete.
2. Mechanically remove contamination on the substrate that may cause damage to the flooring material, this includes paint, permanent and non-permanent markers, pens, crayons, etc. Leaving these on the substrate or marking with them on the back of the material could cause bleed through and damage the flooring.
3. Fill cracks, holes, depressions and irregularities in the substrate to prevent transferring through to the surface of the resilient flooring. Use a high-quality Portland cement based product such as Excelsior installation products provided by Roppe.
4. Do not install material over expansion joints.

3.4 INSTALLATION

- A. General: Follow all relevant guidelines detailed in Division 01, as well as flooring and adhesive manufacturer's technical data sheets.
- B. Recycled Rubber Tile: Install material in accordance with manufacturer's recommendations:
 1. Select the appropriate adhesive for the application and job site conditions.

2. Install material according to directional arrows on the back of the material and do not reverse tiles.
3. Ensure material is rolled appropriately into the adhesive using a 100 lb. three section roller.

3.5 CLEANING & MAINTENANCE

- A. General: Clean up installation area and sweep, dust or wipe material to remove any dirt, dust or debris.
- B. Initial Maintenance: Conduct initial maintenance per the manufacturer's recommended procedures stated in the Maintenance Documents.
- C. Regular Maintenance: Conduct maintenance on regular intervals as needed.

3.6 CLOSEOUT ACTIVITIES

- A. Protection: Protect newly installed material with construction grade paper or protective boards, such as Masonite or Ram Board, to protect material from damage by other trades. Be sure all construction debris is swept up and removed prior to the protective material being installed and does not get trapped underneath.
- B. Limit usage and foot traffic. When moving appliances or heavy furniture, protect wall base from scuffing and tearing using temporary floor protection as well.

END OF SECTION

SECTION 09800 – ACOUSTICAL METAL WALL PANEL SYSTEM

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 Acoustical Metal Wall Panel System as indicated on the architectural drawings.
- B. Related Sections include the Following: (list applicable sections)

1.3 SUBMITTALS

- A. Manufacturer's Literature and Data:
 - 1. Product Data: Submit manufacturer's technical data and brochures for specified system.
- B. Shop Drawings:
 - 1. Shop drawings shall show dimensions, sizes, thickness, finishes, joining, mounting attachments, and relationship to adjoining work.
- C. Samples:
 - 1. Samples shall include a minimum 12" X 12" nominal piece of each type of metal, finished as specified, and accessories.
- D. Certification:
 - 1. Submit certification from manufacturer of wall panels attesting that products comply with specified requirements including finish as specified.
- E. Qualification Data:
 - 1. Firms specified in "Quality Assurance" Article must demonstrate their capabilities and experience by including lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports:
 - 1. All products furnished shall have a flame spread classification of 0-25 for a Class A or Class 1 rating in accordance with ASTM E84.
 - 2. All products furnished shall be tested in accordance with ASTM C-423-90 for Sound Absorption. Test results for a Type A mounting method shall yield an NRC (Noise Reduction Coefficient) of no less than 1.0. Test results for a Type D-100 mounting method shall yield an NRC (Noise Reduction Coefficient) of no less than 1.15.
- G. Maintenance Data:
 - 1. Provide maintenance instructions for acoustical panels to be included in maintenance manuals as specified in Division 1.
- H. Warranty:
 - 1. Provide product warranty for one year from date of substantial project completion.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Firm with manufacturing and delivery capacity required for the project, shall have successfully completed at least ten projects within the past five years, utilizing systems, materials and techniques as herein specified.

- B. Fabricator must own and operate its own Manufacturing facilities for all metal components. Systems consisting of components from a variety of manufacturers will not be considered or accepted.
- C. Manufacturer/Fabricator must own and operate its own Painting and Finishing facility to assure single source responsibility and quality control.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct testing indicated, as documented according to ASTM E 548.

1.5 DELIVERY, STORAGE & HANDLING

- A. All materials shall be protected during fabrication, shipment, site storage and erection to prevent damage to the finished work from other trades. Store acoustical panels inside a well-ventilated area, away from uncured concrete and masonry, and protected from the weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. ALPRO® Systems shall be manufactured by ALPRO® Acoustical Systems, Division of Gordon, Inc., 5023 Hazel Jones Road, Bossier City, LA 71111, (888) 733-3836, FAX (800) 877-8746, www.alproacoustics.com, sales@alproacoustics.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening..

2.2 SYSTEM DESCRIPTION

- A. Wall Panel System shall be ALPRO® Acoustical Systems. All panels, J trim perimeter, corner angles and Z furring, including acoustical component shall be provided as a complete package of this work.
- B. **Contractor Option:**
 - 1. The General Contractor can furnish and install the Acoustical Metal Wall Panel System as detailed and specified in this Section 09800, Acoustical Metal Wall Panel System

or

 - 2. The General Contractor can furnish and install unfaced Sound Attenuation batts at metal stud wall framing, full thickness, with an applied layer of #30 felt over the face layer behind perforated metal panel equal to American Buildings – Interior Perforated Liner Panel LP-1, 24 ga. Interlocking ribs with concealed fasteners, Kynar 500 finish, as selected by Architect from standard colors

2.3 MATERIALS

- A. Mounting Accessories
 - 1. Extruded aluminum, brake form aluminum or brake formed steel as manufactured by ALPRO®, Division of Gordon, Inc. Accessories shall include Z-furring, J Trim and inside/outside corner angles in a size and length to completely support and finish trim the wall panels as shown in elevations. All mounting accessories shall be finished to match corrugated ALPRO® Wall Panels.
 - 2. Aluminum Extrusions shall be 6063-T6 alloy. (ASTM B 221, ASTM B 221 M)
 - 3. General: Provide metals free from surface blemishes where exposed to view in finished unit. Surfaces that exhibit pitting, seam marks, roller marks, stains, and discolorations, or other imperfections on finished units are not acceptable. All metal shall be of the highest grade - commercial type,
- B. Metal Panels

1. Galvanized steel sheet (ASTM A366/A 366M) shall be minimum of .0276" (24 ga) recommended.
 2. The metal acoustical Wall Panels shall be corrugated using (Specified ALPRO® Pattern Type "C") and perforated with 1/8" diameter holes on 21/64" staggered centers, approximately 13% open area.
 3. The panels shall be fabricated of smooth galvanized 24 gauge steel.
- C. Sound Absorption Material:
1. Provide fiberglass 2" thickness X 1.5 # density. The fiberglass panel shall be wrapped in Class A, per ASTM E84, Black Polyethylene.

2.4 FINISHES

- A. Powder Coat Finish
1. All ALPRO® Panels & Accessories shall receive a micro-etched pretreatment prior to receiving an electrostatically applied powder coat paint finish.
 2. All cut edges, including perforated holes must be coated. Finish shall be cured and oven baked to insure paint adhesion and uniform surface hardness.
 3. Paint Color to be selected by architect from ALPRO® Standard Colors (or approved custom color).
- B. Galvanized Steel sheets shall receive a factory applied and baked finish of Fluropon® paint. Galvanized Steel is recommended for interior use only.

PART 3 –EXECUTION

3.1 INSPECTION

- A. Examine building structure scheduled to receive wall panel system for unevenness or irregularities that would affect quality and execution of work.
- B. Tolerances:
1. Install wall panel system with a maximum surface deviation of 1/8" in 4'-0" (No load applied) ASTM 635-92.

3.2 INSTALLATION

- A. General: Comply with manufacturer's printed instructions, governing regulations for Seismic Codes, and with the Ceiling & Interior Systems Construction Association standards applicable to work.
- B. Space Enclosure: Do not install any work until space is enclosed and weatherproofed, wet-work in space is completed and nominally dry, work above ceilings is complete, and temperature and humidity is continuously maintained at values near those of final occupancy.

3.3 CLEANING

- A. Clean all surfaces following installation.
- B. Replace material having scratches, abrasions, or other defects, with unblemished panels, or suspension.
- C. Maintenance per manufacturer's finish maintenance instructions.

3.4 PROTECTION

- A. Protection of ALPRO® Acoustical Systems from damage by other trades after installation to be provided by general contractor.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of painting work is indicated on drawings and schedules, and as herein specified including accent painting.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
 - 1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatments specified under other sections of work.
- C. Work includes field painting of exposed bare and covered pipes, conduits and ducts (including color coding), and of hangers, exposed steel and iron work, and conduits and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
- F. Following categories of work are not included as part of field-applied finish work.
 - 1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, elevator entrance doors and frames, elevator equipment, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.
 - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 - 3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
 - 4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.
- G. Following categories of work are included under other sections of these specifications.
 - 1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
 - 2. Unless otherwise specified, shop priming of fabricated components such as shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.
- H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory

Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer and use only within recommended limits.
- B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
- B. Samples: Prior to beginning work, Architect will furnish color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only.
- C. Provide a listing of material and application for each coat of each finish sample. Provide a 4' x 4' sample application of each color paint for Architect's approval prior to final ordering of product. Sample application shall be applied in an inconspicuous place, satisfactory to the Architect.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 - 1. Name or title of material.
 - 2. Fed. Spec. number, if applicable.
 - 3. Manufacturer's stock number and date of manufacturer.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.6 JOB CONDITIONS

- A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degree F and 90 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degree F and 95 degree F, unless otherwise permitted by paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85% or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
 - 1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during

application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers are listed as acceptable substitutions to the establish minimum standards. Sherwin Williams Products are listed as the standard of product performance and quality.
 - 1. Sherwin Williams Paint Company (SW)
 - 2. Benjamin Moore and Co. (Moore).
 - 3. Pittsburgh Paints (PPG).
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
 - 1. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
 - 2. Federal Specifications establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.
 - 3. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.
- B. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

PART 3 – EXECUTION

3.1 INSPECTION

- A. **Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator. If work is begun before satisfactory conditions are met, then it shall be the Applicators' responsibility for the finish surfaces conditions.**
- B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 - 1. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 - 2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted or provide surface-applied protection prior

- to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
- B. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, cement plaster and cement-asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.
1. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 2. Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid and allow to dry before painting.
- C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
 2. When transparent finish is required, use spar varnish for backpriming.
 3. Backprime all exposed exterior wood. Backprime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.
 4. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.
- D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
1. Touch-up shop-applied prime coats wherever damaged or bare. Clean and touch-up with same type shop primer.
- E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

3.3 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. If film exists, remove film and strain paint material.

3.4 APPLICATION

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.
 1. Provide finish coats which are compatible with prime paints used.

2. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness not less than specified thickness.
 3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
 4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 5. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
 6. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
 7. Sand lightly between each succeeding enamel or varnish coat.
 8. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- D. Prime Coats: Apply prime coat where required to be painted or finished, and which has not been primed coated by others.
1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- F. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats, unless otherwise indicated.
- G. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 FIELD QUALITY CONTROL

- A. The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:
1. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
 2. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali

resistance and quantitative materials analysis.

- B. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.6 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each day.
- B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 - 1. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- D. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.7 EXTRA STOCK

- A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
 - 1. Paint: Furnish not less than one gallon for each type and color, applied.

3.8 EXTERIOR PAINT SCHEDULE

- A. Paint all new roof penetrations at roof areas, including roof attic ventilators and exhaust fan housings.
- B. General: Provide the following paint systems for the various substrates, as indicated.
- C. Ferrous Metals: Gloss Alkyd Enamel: 2 Finish coats over primer with total dry film thickness of not less than 6.0 mils.

1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)

2nd Coat: S-W Industrial Enamel, B54 Series

3rd Coat: S-W Industrial Enamel, B54 Series, (2-4 mils dry per coat)

Optional System:

1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)

2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series

3rd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series, (1.4 – 1.7 mils dry per coat)

- D. Zinc-Coated Metal: Gloss Alkyd Enamel: 2 Finish coats over primer with total dry film thickness of not less than 2.5 mils.

1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)

2nd Coat: S-W Industrial Enamel, B54 Series

3rd Coat: S-W Industrial Enamel, B54 Series,
(2-4 mils dry per coat)

Optional System:

1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series
(5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)

2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series

3rd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series,
(2-4 mils dry per coat)

- E. Painted Wood: Gloss Acrylic: 2 finish coats over primer with total dry film thickness of not less than 5.0 mils. Back prime all trim.

1st Coat: S-W Exterior Oil-Based Wood Primer, Y24W08020
(4 mils wet, 2.2 mils dry)

2nd Coat: S-W SuperPaint Exterior Latex Gloss Paint, A84 Series

3rd Coat: S-W SuperPaint Exterior Latex Gloss Paint, A84 Series
(4 mils wet, 1.5 mils dry per coat)

- F. Stained Woodwork: Stained Finish: 2 Coats of stain on open grain wood.

1st Coat: S-W Woodscapes Exterior Acrylic Solid Color Stain,
(200-400 sq ft/gal) @ 4-8 mils wet; 1.3-2.6 mils dry.

2nd Coat: S-W Woodscapes Exterior Acrylic Solid Color Stain,
(200-400 sq ft/gal) @ 4-8 mils wet; 1.3-2.6 mils dry.

- G. Masonry Surfaces (pre-cast, poured in place, EIFS, Stucco, etc)

1st Coat: S-W Loxon Concrete & Masonry Primer / Sealer, LX02W0050
(5.3 – 8.0 mils wet, 2.1 – 3.2 mils dry per coat)

2nd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series

3rd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series
(5.0 – 7.0 mils wet, 2.1 – 2.9 mils dry per coat)

- H. CMU (Concrete Masonry Units):

1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150
(16.0 – 21.0 mils wet, 8.0 - 10.5 mils dry per coat)

2nd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series

3rd Coat: S-W Loxon Self-Cleaning Acrylic Coating, LX13 Series
(5.0 – 7.0 mils wet, 2.1 – 2.9 mils dry per coat)

3.9 INTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates, as indicated on drawings, schedules and specifications.

- B. Paint all exposed metals (steel framing, mechanical ducts, conduit, etc.) unless otherwise indicated on drawings.

- C. Painter shall identify all fire and smoke partitions above lay in ceilings as follows: Wording shall be "FIRE AND SMOKE BARRIERS - PROTECT ALL OPENINGS" (4" high), to be applied every 8'- 0" o.c.

- D. Pre-Engineered Metal Building/Structural Steel Building Components: Epoxy Eg-Shel Finish: 2 coats over primer with total dry film thickness not less than 6.0 mils. (All Steel/Metal At Interior of Building)

1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer,
B66W01310 (5 – 10 mils wet, 1.9 – 3.8 mils dry per coat)

- 2nd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy EgShel Finish, B73-360 Series (5.0 – 12.0 mils wet, 2.0 – 5.0 mils dry per coat)
- 3rd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy EgShel Finish, B73-360 Series (5.0 – 12.0 mils wet, 2.0 – 5.0 mils dry per coat)
- E. Concrete Masonry Units: **Latex** Semi-Gloss Enamel Finish: 2 Finish coats over filled surface with total dry film thickness of not less than 11.4 mils.
- 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150 (16.0 – 21.0 mils wet, 8.0 - 10.5 mils dry per coat)
- 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31W12651 Series (4 mils wet, 1.5 mils dry per coat)
- F. Epoxy Walls (CMU Walls): 2 coats over filler with total dry film thickness not less than 14.0 mils. (Showers Areas)
- 1st Coat: S-W Pro Industrial Heavy Duty Block Filler, B42W00150 (16.0 – 21.0 mils wet, 8.0 - 10.5 mils dry per coat)
- 2nd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy EgShel Finish, B73-360 Series
- 3rd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy EgShel Finish, B73-360 Series (5.0 – 12.0 mils wet, 2.0 – 5.0 mils dry per coat)
- G. Drywall Walls and Ceilings: Interior Semi-Gloss Finish Acrylic Latex, 3 Coat system with dry film thickness not less than 3.8 mils.
- 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry)
- 2nd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 Series
- 3rd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 Series (4 mils wet, 1.5 mils dry per coat)
- H. Zinc-Coated Metal: Alkyd Gloss Finish: 2 Coats over primer, with total dry film thickness not less than 6.0 mils.
- 1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)
- 2nd Coat: S-W Industrial Enamel, B54 Series
- 3rd Coat: S-W Industrial Enamel, B54 Series, (2-4 mils dry per coat)
- Optional System:*
- 1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)
- 2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series
- 3rd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series, (1.4 – 1.7 mils dry per coat)
- I. Ferrous Metal: Alkyd Gloss Enamel Finish: 2 Finish Coats over primer, with total dry film thickness not less than 6.0 mils.
- 1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)

2nd Coat: S-W Industrial Enamel, B54 Series

3rd Coat: S-W Industrial Enamel, B54 Series,
(2-4 mils dry per coat)

Optional System:

1st Coat: S-W Pro Industrial Pro-Cryl® Universal Acrylic Primer
B66-01310 Series (5.0-10.0 mils wet, 1.9-3.8 mils dry per coat)

2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series

3rd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel, Gloss, B53 Series,
(1.4 – 1.7 mils dry per coat)

J. Wood Doors & Trim: Interior Semi-Gloss Acrylic Latex with dry film thickness not less than 3.8 mils.

1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W02600
(4 mils wet, 1.0 mils dry)

2nd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss,
B31W02651 Series

3rd Coat: S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss,
B31W02651 Series (4 mils wet, 1.5 mils dry per coat)

K. Stained Woodwork: Stained Varnish Rubbed Finish: 3 Finish Coats over stain plus filler on open grain wood.

1st Coat: S-W MinWax Performance Series Tintable Interior Stain
550 VOC, (450-550 sq ft/gal) Available in 250 VOC Version

2nd Coat: S-W MinWax Performance Series Fast-Dry Varnish,

3rd Coat: S-W MinWax Performance Series Fast-Dry Varnish
(600-700 sq ft/gal) (available in Gloss, Semi-Gloss, Satin)

END OF SECTION

SECTION 10110 - DISPLAY CASES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section includes Freestanding Trophy and Display Cases

1.2 REFERENCED STANDARDS

- A. ASTM E84
- B. ASTM B221

1.3 SUBMITTALS

- A. Shop drawings: Provide shop drawings for each type of freestanding display or trophy case required.
- B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.
- C. Samples:
 - 1. Manufacturer's color charts.
 - 2. Composition samples of material and trim to illustrate finish, color and texture.

1.4 OPERATION AND MAINTENANCE

- A. Include data on regular cleaning, stain removal, and precautions.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame/smoke rating in tackboards in accordance with ASTM E84.

1.6 QUALITY ASSURANCE

- A. Manufacturer shall be a firm engaged in the manufacture of display cases in the United States.
- B. Manufacturer shall have a minimum of 5 years experience in the manufacture of display cases.

1.7 FIELD CONDITIONS

- A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.

1.8 WARRANTY

- A. Submit a standard warranty, stating that when installed in accordance with manufacturer's instructions and recommendations, Claridge trophy and display cases are guaranteed for one year against defects in materials and workmanship. Guarantee does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse. Guarantee covers replacement of defective material but does not include cost of removal or reinstallation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Claridge Products and Equipment, Inc., Harrison, Arkansas. Phone: 870-743-2200; Toll Free 800-434-4610; Fax: 870- 743-1908; www.claridgeproducts.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Premiere Freestanding Trophy and Display Cases
 - 1. Tackable Back Panels: Architect to select from Claridge Cork; Fabricork; Hook-Fab; Designer Fabric; or Tan Nucork after Bid Date.

2. Laminate Back Panels: Architect to select from Walnut or Oak grained low-pressure laminate finish back panel after Bid Date.
 3. **Size: 2'-8" x 8'-0"** .
 4. Housing: Perimeter trim is 1-1/2" x 2" extruded aluminum tube; inside cabinet depth is 13-3/4"; O.A. 16"
 5. Floor leveling glides included.
- B. Glass Doors: Glass doors are 3/16" tempered, unless otherwise specified.
 1. Sliding door cases have ground-in finger pulls, doors slide on glides; and are fitted with flat key tumbler locks.
 2. Three Adjustable Glass Shelves, shelf standards and brackets provided: Architect to specify if 6, 8, 10 or 12-inch wide shelves as required.
 - C. Legs or Bases: Freestanding cases are 5'6" O.A.; legs or bases are 18" high.
 1. Bases: Architect to select from Walnut or Oak grained low-pressure laminate finish base.
 - D. Metal Trim and Accessories: Provide aluminum extrusions as manufactured by Claridge Products and Equipment, Inc. Trim shall be heavy gauge extruded aluminum and shall meet or exceed ASTM B221 alloy standards. Finish to be etched and anodized satin finish. Color anodized and powder coat finish trim to be included.
 - E. Colors: As selected by architect from manufacturer's standard colors after Bid Date. Over 50 standard tackboard colors to choose from. Color charts furnished on request.
 - F. Options: Lights to be included.

2.3 FABRICATION

- A. Shop assembly: Provide factory assembled cases to requirements indicated on shop drawings.
- B. Units shall be of dimensions shown in details and in accordance with manufacturer's shop drawings, as approved by architect.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

- A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.
- B. Verify that wall surfaces are prepared and ready to receive cases.

3.2 INSTALLATION

- A. Deliver cases set up, made in one piece.
- B. Follow manufacturer's instructions for storage and handling of units before installation.
- C. Install level and plumb, in accordance with manufacturer's recommendations.

3.3 ADJUST AND CLEAN

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean glass surfaces, back panels and trim, in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION

SECTION 10160 - TOILET PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of toilet partitions is indicated on drawings.
- B. Types of toilet partitions and screens required include the following:
 - 1. Solid phenolic with fused surface laminate, floor-supported, overhead-braced.
- C. Toilet accessories are specified elsewhere in Division 10.

1.3 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.
- B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- C. Samples: Submit full range of color samples for each type of unit required. Submit 6" square samples of each color and finish on same substrate to be used in work, for color selections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Bobrick Wasroom Equipment
 - 2. General Partitions
 - 3. Global (ASI)
 - 4. Bradley Partitions
 - 5. Columbia Partitions
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Materials: Doors, panels and pilasters are composed of compressed cellulose fibers impregnated with resins. The surface laminate is fused to the resin-impregnated core. All edges are machined and finished smooth with beveled edge. Material will not delaminate even under extreme conditions. Materials are non-absorbent, impact and graffiti resistant. Materials are impervious to

steam, soaps and detergents and will not mildew.

- C. Panels: Shall be 1/2" thick with eased edges uniformly machined to a 1/16" radius. Panels are 58" high and anchored to walls with 18 gauge stainless steel continuous brackets and continuous stainless steel brackets at panel to pilaster locations.
- D. Doors: Shall be 3/4" thick with eased edges uniformly machined to a 1/16" radius. Doors are 58" high and mounted to pilasters with continuous stainless steel surface mounted hinge. Pre-threaded inserts are to be provided for all door hardware. Each door is furnished with one coat hook/bumper, slide latches, stops and pulls (for outswing doors) to be made of stainless steel. Door hardware shall allow for lift up emergency access.
- E. Pilasters: Shall be 3/4" thick with eased edges uniformly machined to a 1/16" radius. Pilasters are 83" high (or as indicated on the drawings) and anchored to panels and walls with continuous stainless steel brackets. The pilasters contain no less than two level adjusting bolts on the bottom and attach to the floor with two 3/4" expansion bolts and are braced at the top with aluminum headrail.
- F. Stainless Steel Pilaster Shoes: Shall be 3" high, and constructed of 20-gauge stainless steel. Pilaster shoes are bolted onto pilaster with stainless steel, tamper resistant sex bolts and screws.
- G. Latches and Keepers: Shall be fabricated from stainless steel with a satin finish. Latch is mounted onto door with 1/4" stainless steel torx head bolts pre-threaded inserts and acts as the stop for inswing doors. Keepers are mounted on the pilasters with stainless steel toex head screws.
- H. Headrail: Shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with bright-dip anodized finish. Headrail is anti-grip and attaches to the top of the pilasters with stainless steel, tamper resistant torx screws. Headrail is attached to the adjacent wall construction with a stainless steel headrail bracket.
- I. Headrail Bracket: Shall be made of 16 gauge stainless steel and is attached to the adjacent wall construction with #14 x 1 1/2" stainless steel phillips-head screws and plastic anchors.
- J. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel with pinhead, torx screws and bolts.

2.3 FABRICATION

- A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.
- B. Door Dimensions: Unless otherwise indicated, furnish 24" wide inswinging doors for ordinary toilet stalls and 32" wide (clear opening) outswinging doors at stalls equipped for use by handicapped.
- C. Overhead-Braced Partitions: Furnish stainless steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead-bracing tube at top of each pilaster. Furnish shoe at each pilaster to conceal supports and leveling mechanism.
- D. Floor-Supported Partitions: furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters, to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.
- E. Floor-Supported Over-Head Braced Screens: Furnish pilasters not less than 3/4" in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.
- F. Accessories: Furnish units with chromium-plated finish, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's recommended procedures and installation sequences. Install partitions rigid, straight, plumb, and level.
- B. Provide clearances of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls with full length stainless steel brackets. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.
- C. Overhead-Braced Partitions and Screens: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.
- D. Floor-Supported Partitions: Set pilaster units with anchorages having not less than 2" penetration into structural floor, unless otherwise recommended by partition manufacturer. Level, plumb and tighten installation with devices furnished. Hang doors and adjust so that tops of doors are level with tops partition when doors are in closed position.
- E. Screens: Attach with concealed anchoring devices, as recommended by manufacturer to suit supporting structure. Set units to provide support and to resist lateral impact.
- F. Accessories: Mount accessories to partition units in accordance with manufacturer's instructions.

3.2 ADJUST AND CLEAN

- A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position.
- B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION

SECTION 10200 - LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of louvers and vents is indicated on drawings, including indications of sizes and locations.
 - 1. Fixed Wall Louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets for each product and assembly specified.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Cleaning methods.
- C. Shop Drawings: For units and accessories. Include plans; elevations; sections; and details showing profiles, angles, and spacing of elements. Show unit dimensions related to wall openings and adjacent construction; free area for each size indicated for louvers; profiles of frames at jambs, heads, and sills; and anchorage details and locations.
 - 1. Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 2. For installed products indicated to comply with design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Product Certificates:
 - 1. Air Performance: Certificates signed by Air Movement and Control Association International Inc (AMCA) certifying that the manufacturer's stock units are tested in accordance with AMCA Standard 500 and are licensed to bear the AMCA Certified Ratings Seal in accordance with AMCA Standard 511.
 - 2. Water Penetration: Certificates signed by Air Movement and Control Association International Inc (AMCA) certifying that the manufacturer's stock units are tested in accordance with AMCA Standard 500 and are licensed to bear the AMCA Certified Ratings Seal in accordance with AMCA Standard 511.
 - 3. Weather Louver Effectiveness: Certificates signed by Air Movement and Control Association International Inc (AMCA) certifying that the manufacturer's stock units are tested in accordance with AMCA Standard 500-L99, Section 8.3.2 - Wind Driven Rain Water Penetration Test, and are licensed to bear the AMCA Certified Ratings Seal in accordance

with AMCA Standard 511.

4. Provide AMCA Certification - Water, Air for louvers as scheduled.
- E. 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.
- F. Selection Samples: Two complete color charts showing the full range of colors available for units with factory-applied color finishes.
- G. Samples for Verification: For each finish specified, two samples representing actual finishes specified; prepared on Samples of same thickness and material indicated for final Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years manufacturing similar products. The manufacturer shall have implemented a program for the management of quality objectives, continual improvement, and monitoring of customer satisfaction to assure that customer needs and expectations are met.
- B. Installer Qualifications: Minimum 2 years experience installing similar louvers.
- C. Professional Engineer Qualifications: A professional engineer legally qualified to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of products that are similar to those indicated for this Project in material, design, and extent.
- D. Source Limitations: Obtain products through one source from a single manufacturer where alike in one or more respects regarding type, design, or factory-applied color finish.
- E. Welding Standards: As follows:
 1. Comply with AWS D1.2, "Structural Welding Code - Aluminum."
 2. Comply with AWS D1.3, "Structural Welding Code - Sheet Steel."
- F. AMCA Standard 500-L: Air performance, water penetration and air leakage ratings shall be determined in accordance with Air Movement and Control Association International Inc (AMCA) Standard 500, "Laboratory Methods of Testing Louvers for Rating."
- G. SMACNA Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.6 SEQUENCING AND SCHEDULING

- A. Field Measurements: Verify openings and adjacent construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.
 2. Coordinate Setting Drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Manufacturer shall provide standard limited warranty for louver systems for a period of five years (60 months) from date of installation, no more than 60 months after shipment from manufacturing plant. When notified in writing from the Owner of a manufacturing defect, manufacturer shall promptly correct deficiencies without direct financial cost to the Owner.
- B. Manufacturer shall provide 20 year limited warranty for fluoropolymer-based finish on extruded aluminum substrates.
 - 1. Finish coating shall not peel, blister, chip, crack or check.
 - 2. Chalking, fading or erosion of finish when measured by the following tests:
 - a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
 - b. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244 and ASTM D822.
 - c. Finish coating shall not erode at a rate in excess of 10%/ 5 year as determined by Florida test sample.
- C. Manufacturer shall provide a 5 year limited warranty for Class I and a 3 year limited warranty for Class II anodized finish on extruded aluminum substrates.
 - 1. Seller warrants the Finish under normal atmospheric conditions.
 - a. Will not crack, craze, flake or blister
 - b. Will not change or fade more than (5) Delta-E Hunter units as determined by ASTM method D-2244
 - c. Will not chalk in excess of ASTM D-4214-07 number (8) rating, determined by the procedure outlined in ASTM D-4214-07 specification test.
 - 2. Any forming or welding must be done prior to finishing. Post forming or welding will void the warranty.
 - 3. This Warranty applies only if the anodized aluminum product is installed in strict accordance with Seller's recommended practices and maintained in accordance with AAMA (American Architectural Manufacturers Association) publication number 609 and 610-09 ("Cleaning and Maintenance Guide for Architecturally Finished Aluminum").

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to established minimum standards for materials, workmanship and functions:
 - 1. Reliable Architectural Products (Basis of Design) |1300 Enterprise Road, Geneva, Alabama 36340 | PH: 334.684.3621 or 800.624.3914 | www.reliablelouvers.com.
 - 2. Ruskin Company | 3900 Dr. Greaves Rd. Grandview, MO 64030 | PH: 816.761.7476 | www.ruskin.com.
 - 3. The Airolite Company, LLC. | Ph:715.841.8757 | www.airolite.com.
 - 4. Air Performance Louvers LLC. | 159 Genco Drive, Hartford, AL 36344 | Ph: 334.588.0191 or 588.0070 | www.airperformancellc.com.
 - 5. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 STATIONARY BLADE LOUVER

- A. Model 4375Z125 as manufactured by Reliable Louver Company
- B. Fabrication:

1. Design: Stationary non- drainable louver with drain gutters in head frame with downspouts in the jambs and mullions with all welded construction. Hidden vertical supports to allow unlimited continuous line appearance. Steeply angled integral sill.
 2. Frame:
 - a. Frame Depth: 4 inches (102 mm).
 - b. Wall Thickness: .081 inch (2.1 mm) nominal.
 - c. Material: Extruded aluminum, Alloy 6063-T6.
 3. Blades:

Style: Non- Drainable: 37.5 degrees at 5-3/32 inches (129 mm)

 - a. Wall Thickness: 0.081 inch (2.1 mm), nominal.
 - b. Material: Extruded aluminum, Alloy 6063 T6.
 4. Minimum Assembly Size: 12 inches wide by 12 inches high (305 mm x 305 mm).
 5. Maximum Factory Assembly Size: Single sections shall not exceed 120 inches wide by 90 inches high (3048 mm x 2286 mm) or 90 inches wide by 120 inches high (2286 mm x 3048). Louvers larger than the maximum single size shall be require field assembly of smaller sections.
 6. Recycled Content: 18% post-consumer. 55% pre-consumer, post-industrial, total 73% by weight.
- C. Performance Data:
1. Based on testing 48 inch x 48 inch (1,219 mm x 1,219 mm) size unit in accordance with AMCA 500.
 2. Free Area: 54 percent, nominal.
 3. Free Area Size: 8.58 square feet (0.79 m²).
 4. Maximum Recommended Air Flow through Free Area: 803 feet per minute (4.08 m/s).
 5. Air Flow: 6890 cubic feet per minute (3.25 m³/s).
 6. Maximum Pressure Drop (Intake): 0.15 inches w.g. (0.035 kPa).
 7. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/m²) of free area at an air flow of 803 feet per minute (4.08 m/s) free area velocity when tested for 15 minutes.
- D. Design Windload: Per Code.
- E. Louvers shall be factory engineered to withstand the specified seismic loads.
1. Minimum design loads shall be calculated to comply with ASCE – 7, or local requirements of Authority Having Jurisdiction (AHJ).

2.3 ACCESSORIES

- A. Bird Screen: Install insect screens on intake louvers and bird screens on exhaust louvers. Do not install insect screens on HVAC intake louvers.
 1. Aluminum: Aluminum, 5/8 inches by 0.040 inch (16 mm by 1 mm), expanded and flattened.
 2. Frame: Removable. Re-wireable.
- B. Insect Screens: Install insect screens on intake louvers and bird screens on exhaust louvers. Do not install insect screens on HVAC intake louvers.
 1. Aluminum: 18-16 mesh, mill finish, .011 inch (0.3 mm) wire.
 2. Frame: Aluminum.
- C. Extended Sills:
 1. Extruded aluminum, Alloy 6063-T6. Minimum nominal thickness 0.060 inch (1.5 mm).

2. Formed aluminum, Alloy 3003. Minimum nominal thickness 0.081 inch (2.1 mm).
- D. Visible Mullions: Manufacturer's standard horizontal or vertical visible mullions for architectural accent as indicated on drawings.

2.4 FINISHES

- A. Finish: 70 percent PVDF: Finish shall be applied at 1.2 mil total dry film thickness.
1. Coating shall conform to AAMA 2605. Apply coating following cleaning and pretreatment. Cleaning: AA-C12C42R1X.
 - a. Standard 2-coat.
 2. 20-year finish warranty.
- B. Color: Color to be selected by Architect.

2.5 MATERIALS, GENERAL

- A. Fastenings: Use same material as items fastened, unless otherwise indicated. Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum. Provide types, gages and lengths to suit unit installation conditions. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- B. Anchors and Inserts: Use metal anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required.
- C. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.6 FABRICATION, GENERAL

- A. Provide louvers and accessories of design, materials, sizes, depth, arrangement, and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; air leakage where applicable (for adjustable units, if any); strength; durability; and uniform appearance.
- B. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.
- C. Include supports, anchorages, and accessories required for complete assembly.
- D. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.
- E. Maintain equal blade spacing, including separation between blades and frames at head and sill to produce uniform appearance.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Prepare substrates and openings using methods recommended by manufacturer for achieving best result for substrates under project conditions.
- B. Do not proceed with installation until substrates and nailers have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
1. Locate and place units level, plumb, and at indicated alignment with adjacent work.
 2. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws

where required to protect metal surfaces and to make a weathertight connection.

3. Form closely fitted joints with exposed connections accurately located and secured.
 4. Provide perimeter reveals and openings of uniform width for sealants and joint fillers as indicated on Drawings.
 5. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
 6. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- B. Install concealed gaskets, flashings, joint fillers, and insulation, as installation progresses, where weathertight joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation.

3.3 ADJUSTING, CLEANING AND PROTECTION

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Protect products from damage until completion of project. Use temporary protective coverings where needed and approved by manufacturer. Remove protective covering at the time of Substantial Completion.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10350 - FLAGPOLE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of flagpoles is indicated on the drawings.

1.3 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings accessories, bases and anchorage devices.
- B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90 mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.
- C. Pole Construction: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required.
- B. Shop Drawings: Submit shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.
- C. Samples: Submit samples of each finished metal for flagpoles, and accessories as may be requested.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Spiral wrap flagpoles with heavy Kraft paper or other protective wrapping and prepare for shipment in hard fiber tube or other protective container.
- B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Morgan-Francis Flagpoles and Accessories | www.morgan-francis.com | PH: 1.800.814.9568.
 - 2. Acme Lingo Flagpoles | www.acmelingo.net | PH: 1.800.260.1897.
 - 3. American Flagpole, Div. of Kearney-National | www.concordamericanflagpole.com | PH: 972.380.8186.
 - 4. Eder Flag & Baartol Company / A Division of Eder Flag Manufacturing Co., Inc. | www.ederflag.com | PH: 1.800.558.6044 or 414.764.3522.
 - 5. Equal products of other manufacturers may be used provide such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 FLAGPOLE TYPE

- A. Aluminum Flagpoles: Fabricate aluminum flagpoles from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16" (0.1875"), tensile

strength not less than 35,000 psi and a yield point of 30,000 psi. Heat-treat and age-harden flagpoles after fabrication.

B. Flagpole Heights as follows:

1. 40 feet above grade.

C. Provide cone tapered aluminum flagpole.

2.3 FLAGPOLE MOUNTING

A. Provide manufacturer's standard base system for the type of flag pole installation required.

B. Base Plate: For anchor-bolt mounting, furnish manufacturer's standard cast metal shoe base of same material as flagpole. Furnish and install anchor bolts and lightning ground spike as required.

C. Foundation Tube: For ground-set flagpoles, provide 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.

1. Provide manufacturer's standard flash collar, finished to match flagpole.

2.4 SHAFT FINISH

A. Aluminum: Fine, directional, mechanical satin polish (NAAMM-32), finished as follows:

1. Color: Clear anodized finish complying with NAAMM-C22A42, Class I (0.7 mil.)

2.5 FITTINGS

A. Finial Ball: Manufacturer's standard flush seam ball, size as indicated or, if not indicated, to match pole butt diameter.

1. 14 ga. spun aluminum,

2. Brass color.

B. Truck: Ball-bearing non-fouling, revolving, double-track assembly of cast metal, finished to match pole shaft.

C. Cleats: Two 9" cast metal cleats with fasteners, finished to match pole shaft.

D. Halyards: Provide 2 continuous halyards for each flagpole, as follows:

1. Polypropylene, bronze, braided

2. Size: 3/8" (No. 12).

E. Halyard Flag Snaps:

1. Provide 2 swivel snaps per halyard

2. Aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Flagpole Installation: Install flagpoles as shown and in compliance with final shop drawings and manufacturer's instructions.

END OF SECTION

SECTION 10410 - IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Types of identifying devices specified in this section include the following:
 - 1. Room Signs (See Door Schedule)
 - 2. Metal Letters
 - 3. Plaque
 - 4. Project Sign
- B. Note to the Contractor: If the Contract Sum (as awarded) is \$100,000.00 or more, the Contractor shall furnish and erect a project sign and interior plaques as shown in "Detail of Project Sign" (DCM Form C-15) and "Plaque Detail" bound in the Project Manual at the end of "General 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.
- C. Extent of signs and plaque is indicated on the drawings.

1.3 QUALITY ASSURANCE

- A. Drawings and Specifications are based on one manufacturer's standard products. Another standard system of a similar and equivalent nature may be acceptable when the differences do not materially detract from the design concept or intended performance as judged solely by the Architect.
- B. **General Contractor is responsible for verifying signage requirements and correct wording, names etc. with Owner and Architect before ordering.**

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for each type of device. Include large scale sections of typical members and other components. Provide dimensioned elevations. Show anchorages, grounds and reinforcement and indicate finishes.

PART 2 - PRODUCTS

2.1 ROOM SIGNS

- A. MANUFACTURER:
 - 1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. ASI Sign Systems, Inc., 8181 Jetstar Drive, Suite 100, Irving, TX 75063; www.asisignage.com; 1-800-274-7732
 - b. Best Sign Systems, www.bestsigns.com; 1202 N. Park Avenue, Montrose, CO 81401-3171, Phone (970) 249-2378 or 1-800-235-2378; Fax (970) 249-0223
 - c. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699-3342
 - d. Bayuk Graphic Systems, Inc., www.bayukgraphics.com; 5005 Old Lincoln Highway Parkesburg, PA 19365; Phone: (717)-442-0274; Fax: (717)-442-1289
 - 2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS:

1. Provide 6" x 8" high laminated plastic with raised lettering complying with the Americans with Disabilities Act (ADA).
2. Color to be selected by the Architect after bid date from manufacturer standards.
3. Use International Symbols of accessibility for identifying facilities as accessible.
4. Letters and numerals shall be raised 1/32 in (0.8 mm) minimum, upper case, sans serif or simple serif type and shall be accompanied with Grade 2 Braille.
5. Raised characters shall be at least 5/8 in (16 mm) high, but no higher than 2 in (50 mm).
6. Pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be 6 in (152 mm) minimum in height.
7. **See Door Schedule. If not shown provide 20 letter characters per room sign.**
8. **The Supplier will be required to meet with the Owner for exact wording for all room signs before preparation of the shop drawing submittal to the Architect for approval.)**
9. Tactile characters on signs shall be located 48 inches (1220 mm) minimum above the finish floor or ground surface, measured from the baseline of the lowest tactile character and 60 inches (1525 mm) maximum above the finish floor or ground surface, measured from the baseline of the highest tactile character.
 - a. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.
 - b. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf.
 - c. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right hand door.
 - d. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.
 - e. Signs containing tactile characters shall be located so that a clear floor space of 18 inches (455 mm) minimum by 18 inches (455 mm) minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position. Mounting devices shall be concealed.

2.2 METAL LETTERS

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Impact Architectural Signs, www.impactsigns.com; 26 E. Burlington Avenue, LaGrange, IL 60525; (708) 469-7178; impact@impactsigns.com
 - b. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699- 3342
 - c. Matthews Architectural Products, www.matthewsid.com; 2 North Shore Pittsburgh, PA 15212; (412) 571-5500; (800) 950-1317
2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS

1. Provide standard cast aluminum letters for exterior architectural signage shown on drawings and as follows:

2. Building Signage: Provide full size sample prior to manufacture of all letters.
 - a. Mounting shall be projected mount without collars set in adhesive.
 - b. Color shall be anodized aluminum.
 - c. Style of letter shall be as follows:
 - I. Height: 15" High - Upper Case.
 - II. Depth: 1 ¼" Deep – Upper Case.
 - III. Font: Arial Bold
 - IV. Letters to read as indicated on drawings.

2.3 PLAQUE

A. MANUFACTURER:

1. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function.
 - a. Impact Architectural Signs, www.impactsigns.com; 26 E. Burlington Avenue, LaGrange, IL 60525; (708) 469-7178; impact@impactsigns.com
 - b. Leeds Architectural Letters of Alabama Inc, www.leedsletters.com; P.O. Box 40, Leeds, AL 35094; Phone (205) 699-5271; Fax (205) 699- 3342
 - c. Matthews Architectural Products, www.matthewsid.com; 2 North Shore Pittsburgh, PA 15212; (412) 571-5500; (800) 950-1317
2. Substitutions: Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

B. MATERIALS

1. Refer to *Detail Of Plaque (ABC Form C-16, August 2001)* at the front end of the project manual.
2. Size: 24" high x 30" wide.
3. Cast aluminum with bronze finish of standard alloy, hand tooled and chased.
4. Raised letters and border.
5. Satin finish.
6. Background pebbled finish and oxidized to a darker finish.
7. Casting to be free of pits and holes, square and true with no warping.
8. Border style to be single line.
9. Letters to be flat face classic design.
10. Furnish Rubbing to Architect for approval.

C. Wording on the plaque shall read as follows.

A NEW GYMNASIUM
FOR
COLD SPRINGS HIGH SCHOOL
BREMEN, ALABAMA

ERECTED 2022

STATE OF ALABAMA

THE CULLMAN COUNTY BOARD OF EDUCATION
MR. SHANE RUSK, PRESIDENT
MR. HEATH ALLBRIGHT, BOARD MEMBER
MR. KENNY BROCKMAN, BOARD MEMBER
MR. MIKE GRAVES, BOARD MEMBER
MR. WAYNE MYREX, BOARD MEMBER
MR. KERRY NEIGHBORS, BOARD MEMBER
MR. GENE SULLINS, BOARD MEMBER
DR. SHANE BARNETTE, SUPERINTENDENT

SUPERVISED BY
STATE DEPARTMENT OF FINANCE, DIVISION OF CONSTRUCTION MANAGEMENT

McKEE AND ASSOCIATES ARCHITECTS, INC.

NAME TO BE FURNISHED - CONTRACTOR

2.4 PROJECT SIGN

A. MATERIALS

1. Refer to *Detail of Project Sign (DCM Form C-15, January 2020)* at the front end of the project manual.

B. Wording on the project sign shall read as follow.

STATE OF ALABAMA

THE CULLMAN COUNTY BOARD OF EDUCATION
MR. SHANE RUSK, PRESIDENT
MR. HEATH ALLBRIGHT, BOARD MEMBER
MR. KENNY BROCKMAN, BOARD MEMBER
MR. MIKE GRAVES, BOARD MEMBER
MR. WAYNE MYREX, BOARD MEMBER
MR. KERRY NEIGHBORS, BOARD MEMBER
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"Progress through Education"

A NEW GYMNASIUM
FOR
COLD SPRINGS HIGH SCHOOL
BREMEN, ALABAMA

STATE DEPARTMENT OF FINANCE, DIVISION OF CONSTRUCTION MANAGEMENT

McKEE AND ASSOCIATES ARCHITECTS, INC

NAME TO BE FURNISHED – CONTRACTOR

2.5 FABRICATION

- A. General: Fabricate signs to comply with requirements indicated including, dimensions, design details, quality, thickness and finish of materials. Use materials and shapes of sufficient thickness, with reinforcing, if needed, to produce sufficient flatness, free of "oil canning", and to impart sufficient strength for size, design and application indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units plumb and level, in locations and with mounting shown. Securely attach to the supporting structure with concealed fasteners, in accordance with the manufacturer's installation instructions.

3.2 CLEANING AND PROTECTION

- A. At completion of the installation, clean surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 10440 - FIRE EXTINGUISHERS AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire Extinguishers.
 - 2. Extinguisher cabinets.
 - 3. Accessories.
- B. Related Requirements:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International (ASTM):
 - a. ASTM E814-11a, Standard Test Method for Fire Tests of Penetration Firestop Systems.
 - 2. International Code Council (ICC):
 - a. International Building Code (IBC) - Current Edition.
 - 3. Intertek Testing Services/Warnock-Hersey International (ITS/WHI)
 - 4. National Fire Protection Association (NFPA):
 - a. NFPA 10-2010, Standard for Portable Fire Extinguishers: For criteria covering installations for Class A, B, C, D, and K hazards as well as the selection, inspection, maintenance, recharging, and testing of portable fire extinguishing equipment.
 - b. NFPA 70-2011, National Electrical Code.
 - 5. Underwriters Laboratories, Inc. (UL)
 - 6. United States Code (USC):
 - a. Americans with Disabilities Act of 1990, as amended by the ADA Amendments Act of 2008: For restrictions relating to cabinet projections in corridors.

1.3 ACTION SUBMITTALS

- A. Submit in accordance with Section 01600:
 - 1. Product Data:
 - a. Cabinets: Materials description for fire extinguisher cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.
 - b. Extinguishers: Materials description for fire extinguishers; include ratings and classifications.
 - c. Installation instructions for each product specified.
 - 2. Shop Drawings:
 - a. Small-scale plans showing locations of fire extinguisher cabinets and individual fire extinguishers.
 - b. Schedules showing each type of cabinet and extinguisher to ensure proper fit and function.

- c. Indicate installation procedures and accessories required for a complete installation.
- 3. Samples:
 - a. Extinguisher Cabinet Door and Trim Finishes: For each type of exposed finish required, prepared on samples of size indicated below:
 - i. Size: 6 inches (150 mm) square.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Comply with standards referenced in Article 1.02 - REFERENCES.
- B. Provide fire extinguishers, cabinets and accessories produced by a single manufacturer.
- C. Provide fire extinguishers of type approved by UL, State Fire Marshal's Office, and local regulatory agencies, if any.
- D. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle fire protection specialties and related materials using means and methods that will prevent damage, deterioration, or loss.
 - 1. Deliver components in manufacturer's original packaging, properly labeled for identification.

1.7 WARRANTY

- A. All Fire Protection Products (except fire extinguishers) carry a one year warranty after date of shipment against defects in materials or workmanship. Fire extinguishers carry a longer warranty. We will replace or repair any product found defective within this period. No other warranty expressed or implied is valid. Manufacturer's warranty, terms and conditions apply in all cases. Please see complete warranty on our website for more details.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SPECIALTIES MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. J. L. Industries, Inc., a division of Activar Construction Products Group; 9702 Newton Av S Bloomington, MN 55431; (800) 554-6077, (952) 835-6850, (952) 835-2218 (FAX); SALES@ACTIVARCPG.COM; www.activarcpg.com
 - 2. Larsen's Manufacturing Company
 - 3. Modern Metal Products
- B. Substitutions: Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 FIRE EXTINGUISHERS

- A. Multi-Purpose Chemical Type: Extinguisher unit containing a fluidized and siliconized mono ammonium phosphate powder; nonconductive and nontoxic.
 - 1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright squeeze grip.
 - 2. Finish: Factory powder-coated; Red.
 - 3. Effectiveness (Rating): Class A, B, and C fires.

4. Model Identification and UL Rating: Cosmic **10E; 4A-80BC**.
 5. "Start Up Tags" for each fire extinguisher must be provided and approved by Local Fire Department before Final Inspection.
- B. Class K Wet Chemical Type(Concessions): Extinguisher unit containing a low "pH" potassium acetate solution.
1. Construction: Stainless steel cylinder with protective nozzle tip orifice seal and nonmetallic nozzle tip finger guard, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
 2. Effectiveness (Rating): Class K fires.
 3. Model Identification and and UL Rating: **25; Class K**. Capacity: 2.5 gal.

2.3 EXTINGUISHER CABINETS

- A. Cabinet with Steel Trim and Door:
1. **Ambassador Series, Model 1017F10** at Non-Fire Rated Walls.
 2. **Ambassador Series, Model 1017F10FX2** at Fire Rated Walls.
- B. Cabinet Style: **Semi-recessed**.
1. Tub: Cold-rolled steel.
 - a. Finish: Factory-applied powder coat paint finish.
 - i. To be selected by Architect after bid date from manufacturer Standard Colors.
 2. Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated handle with roller catch.
 - a. Finish: Factory-applied powder coat paint finish.
 - i. To be selected by Architect after bid date from manufacturer Standard Colors.
 3. Trim Style and Depth: Cabinets located in corridors shall not protrude into the hall way more than 2 1/2".
 - a. Semi-Recessed Cabinet:
 - i. Rolled Edge: 2-1/2 inch (63.50 mm).
 - b. Trim Dimensions: 1-3/4 inch (44.45 mm) face trim on frame and 1-1/4 inch (31.75 mm) face trim on door.
- C. Fire-Rating: Provide Fire-Rated cabinets for 1-hour and 2-hour combustible and noncombustible wall systems as required.

2.4 CABINET DOOR STYLES, GLAZING TYPES, AND ADDITIONAL OPTIONS

- A. Door Style:
1. Style F: Full glazing; with pull handle.
- B. Door Glazing:
1. Type 10: Clear acrylic.
- C. Additional Options:
1. Cabinet Lettering:
 - a. Text: FIRE EXTINGUISHER.
 - b. Color(s): [Red] [Black] [White]. To be selected by Architect after bid date.

2.5 SOURCE QUALITY CONTROL

- A. Ship extinguishers to the Project site fully charged, EXCEPT those which contain water as an

FIRE EXTINGUISHERS AND ACCESSORIES

extinguishing agent, if any.

- B. Obtain Fire Extinguishers and Fire Extinguisher Brackets from same manufacturer to ensure compatibility.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed and blocking where surface mounted cabinets will be installed.
 - 1. Notify the Contractor in writing of conditions detrimental to proper and timely completion of the installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
 - 3. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.
- B. Cabinet Lettering:
 - 1. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk screen process. Provide lettering on door as indicated, or if not indicated, as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

3.3 FIELD QUALITY CONTROL

- A. Ensure that each extinguisher is fully charged, and that inspection of each extinguisher has been performed, as evidenced by the National Association of Fire Equipment Distributors certification tag, just prior to turnover.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 10500 - LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Products in this section include the following:
 - 1. Furnish and install factory-assembled Heavy-Duty MIG-Welded Metal Lockers, complete, as shown and specified per contract documents.

RELATED WORK

Section 03310, Cast-In-Place Concrete.

- A. Section 06100, Rough Carpentry.

1.3 QUALITY ASSURANCE

- A. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. **Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable.** Grind exposed welds and metal edges flush and make safe to touch.
- B. MANUFACTURING STANDARD: **Imported Manufactured Lockers will not be accepted.** Provide metal lockers that are standard products of a single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
- C. FABRICATOR QUALIFICATIONS: **Imported Fabricated Lockers will not be accepted.** Firm experience (minimum 5 years) in successfully producing the type of metal lockers indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- D. INSTALLER QUALIFICATIONS: Engage an experienced (minimum 2 years) installer who has successfully completed installation of the type of metal lockers and extent to that indicated for this project.
- E. Lockers shall be GREENGUARD Children & Schools CertifiedSM

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for metal locker units.
- B. Samples: Submit color samples on squares of same metal to be used for fabrication of lockers.
- C. Shop Drawings: Submit shop drawings for metal lockers, showing locker types, sizes, quantities, Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.

1.5 PRODUCT HANDLING

- A. GENERAL: All work shall be fabricated in ample time so as to not delay construction process.
- B. DELIVERY: All materials shall be delivered to the site at such a time as required for proper coordination of the work. Materials are to be received in the manufacturer's original, unopened packages and shall bear the manufacturer's label.
- C. STORAGE: Store all materials in a dry and well ventilated place adequately protected from the elements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers' products have been used to established minimum standards for materials, workmanship and functions:
1. List Industries Inc., Superior (Basis of Design); 401 Jim Moran Blvd., Deerfield Beach, Florida 33442; www.listindustries.com; PH: 1.800.776.1342.
 2. Penco; 1820 Stonhenge Drive, Greenville, NC 27858; www.pencoproducts.com; PH: 800.562.1000.
 3. De Bourgh Manufacturing Co. | 27505 Otero Ave. La Junta, CO 81050 | Ph: 800.328.8829 | www.debourgh.com.
 4. Tennsco Corp. | 201 Tennsco Drive, Dickson, TN 37055 | PH: 866.446.8686 | www.tennsco.com.
 5. Lyon; 420 N. Main Street, Montgomery, IL 60538; www.lyonworkspace.com.; PH: 800.433.8488.

2.2 LOCKERS

A. SUPERIOR ALL-STAR MVP SPORT FULLY FRAMED ALL-WELDED LOCKERS

1. Location(s): **Girl's Varsity Locker Room 011.**
Boy's Varsity Locker Room 019.
2. Size: 24" W x 24" D x 72" H
3. Materials:
 - a. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of custom blend powder coat.
 - b. Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slot less type; self-locking nuts or lock washers.
 - c. Hardware: Hooks of cadmium plated, zinc plated steel or cast aluminum. Coat rods of stainless steel tube.
 - d. Handle: Zinc plated, cold rolled steel finger pull.
 - e. Number Plates: To be aluminum with not less than 3/8" high etched numbers attached to door with two aluminum rivets. **NOTE: Prior to placing any orders for Number Plates, the General Contractor is responsible for verifying Locker numbering sequence with the Owner.**
4. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.
5. Frame / Vertical Side panels: Shall be of 13 gauge 1/2" flattened expanded metal framed by 16 gauge Hollow "T" tubular sections and channel frame members designed to enclose all four edges of the side panel with the entire assembly MIG welded to form a rigid frame for each locker. The channel frame members are welded to the front and rear vertical frame members to create and anchor bearing surface of 1-1/4 inches wide x the depth of the locker at each side panel. Note: Diamond perforated sheet steel or 3/4" expanded metal will NOT be accepted.
6. Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit.

7. Hat Shelf, Intermediate Shelves and Bottoms: Shall be 16 gauge galvaneal sheet-steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side. Locker bottom shelf located less than 2" above floor level will not be acceptable.
8. Backs: Shall be 18 gauge cold rolled sheet-steel, be continuous to cover a multiple framed unit and be welded to each vertical side panel frame member.
9. Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish.
 - a. Color to be selected by Architect from manufacturer's standard list of colors. Two-Tone Color Combination (if optional security compartment included): Shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturers standard selection.
10. Include Optional Upper Security Compartment:
 - a. Full-Width Upper Security Compartment: Shall be top hinged and be fabricated from single sheet prime 14 gauge with single bend at top and sides with a double bend at latch point (bottom). Door shall be perforated with Security-Plus ventilation. A spring loaded galvanized latch assembly shall be securely welded to the inside of the door. The latch shall be a minimum of 11 gauge, be equipped with a stainless steel spring and shall automatically engage when door is closed. Rubber bumpers shall be riveted to return bends on doors. Locking devise shall be designed for use with both a padlock and built-in lock. Top hinged gym door shall be hinged using a 3/16" diameter continuous hinge rod completely recessed into the door with a concealed fastener. Padlock Strike Plates are required.
11. Include Foot Locker:
 - a. Foot Locker: Seat shall be formed of 14 gauge cold rolled sheet steel with stiffener sections for reinforcement and be prepared for padlock. Foot Locker front panel shall be 14 gauge cold rolled sheet-steel with Security-Plus ventilation. A rubber bumper is to be mounted to locker back to cushion seat in the open position. Padlock Strike Plates are required.
12. Equipment: Equipment: Furnish each locker with the following items:
 - a. Furnish each locker with one galvaneal hat/intermediate shelf and two single prong wall hooks.
 - b. Stainless Steel Coat Rod: Furnish each locker with one full locker width coat rod which shall be 1" diameter stainless steel tubing factory attached below upper hat shelf.
 - c. Finished End Panels (If required): Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.
 - d. Fillers (if required): Provide where indicated of not less than 16 gauge sheet steel, factory fabricated and finished to match lockers.
13. LOCKS:
 - a. Built-In Combination Locks: Built-in combination automatic dead bolt locks with 5 control keys. Locks must be capable of a minimum of five combination changes.
14. Lifetime Warranty: Lockers shall be covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

B. SUPERIOR MARQUIS PROTECTOR FULLY FRAMED ALL-WELDED LOCKERS

1. Location(s): As Indicated on Drawings.
2. Type:
 - a. Single Tier – At **Referee Lockers 027 and 028**.
3. Materials:
 - a. Doors: 14 gauge solid sheet steel with recessed handle, and single-point latching
 - b. Sides: Fully-framed 18 gauge solid sheet steel.
 - c. Tops, Bottoms, Shelves: 16 gauge solid sheet steel
 - d. Backs: 18 gauge solid sheet steel
4. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.
5. Frame / Vertical Side panels: Shall be of 18 gauge solid cold rolled sheet steel framed by 16 gauge Hollow "T" tubular sections and channel frame members designed to enclose all four edges of the side panel with the entire assembly MIG welded to form a rigid frame for each locker. The channel frame members are welded to the front and rear vertical frame members to create and anchor bearing surface of 1-1/4 inches wide x the depth of the locker at each side panel.
6. Integral Frame Locker base: 14 gauge formed structural channels are MIG welded to the front and rear vertical side panel frame members to allow placement of locker bottom a minimum 2-3/4" above floor level. Locker bottom shelf located less than 2" above floor level will not be acceptable.
7. Doors: Marquis Protector Wardrobe And Gym Doors: Outer door to be fabricated from single sheet prime 14 gauge with single bends at top and bottom and double bends at the sides with a 3" wide 18 gauge full height channel door stiffener MIG welded to the hinge side of the door as well as to the top and bottom door return bends and spot welded to the inside of door face to form a rigid torque-free box reinforcement for the door. Doors are to be solid (non-perforated) with ventilating perforations in the top and bottom door flanges.
8. Handle: Marquis Seamless Drawn Stainless Steel Recessed Locker Handle: All locker doors shall have a seamless drawn not less than 304 stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recess pan shall be deep enough to have the lock be completely flush with the outer door face. The pull handle shall be drawn into the left side of the handle for easy opening of the locker door.
9. Latch Assembly: The latching mechanism shall be single-point rigid non-moving positive latch by means of a heavy gauge (minimum 11 gauge) latch securely welded to the framed vertical divider. The latch assembly must be made of a single piece of steel and have a padlock loop that inserts through the recess pan. Locking device shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 11 gauge (minimum) with riveted bumpers and shall be MIG welded to vertical frame member.
10. Door Hinges: Hinges shall not be less than 3-1/2" long 13 gauge seven knuckle pin type, securely riveted to frame and welded to the door. Doors are to be secured to frame with a minimum of two tamper resistant rivets per hinge. Provide 3 hinges for doors 48" and higher and 2 for doors shorter than 48". All doors shall be right hand side hinged.
11. Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit.
12. Hat Shelves, Intermediate Shelves and Bottoms: Shall be 16 gauge galvaneal sheet steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members

at all four corners and be securely welded to the frame and side. Locker bottom shelf located less than 2" above floor level will not be acceptable.

13. Backs: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple framed unit and be welded to each vertical side panel frame member.
14. Finished End Panels (If required): Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.
15. Continuous Slope Tops (If required): Not less than 18 gauge sheet steel approximately 18 degrees pitch, in lengths as long as practical but not less than four lockers. To be installed in addition to the locker flat top with end closures for support. Finished to match lockers.
16. Fillers (if required): Provide where indicated, of not less than 16 gauge sheet steel, factory fabricated and finished to match lockers.
17. Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. **Color to be selected by Architect from manufacturer's standard list of colors.** Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturers standard selection.
18. Equipment: Furnish each locker with the following items, unless otherwise shown.
 - a. Single tier lockers: Openings 60" and 72" shall include one galvanized hat shelf, one double prong ceiling hook and a minimum of two single prong wall hooks.
 - b. Double and triple tier lockers: Openings 20" thru 36" high shall include one double prong ceiling hook and a minimum of two single prong wall hooks.
19. LOCKS:
 - a. Built-In Combination Locks: Built-in combination automatic dead bolt locks with 5 control keys. Locks must be capable of a minimum of five combination changes.
20. Lifetime Warranty: Superior Fully-Framed All-Welded Lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication of special components, when possible, to ensure proper fitting of work. However, allow for adjustment and fitting of trim and filler panels wherever taking of field measurements before fabrication might delay work.

3.2 INSTALLATION

- A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.
- B. Space fastenings about 48" o.c., unless otherwise recommended by manufacturer, and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal fasteners insofar as possible.
- C. Install trim, and metal filler panels where indicated, using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

3.3 ADJUST AND CLEAN

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.
- B. Touch up marred finishes but replace units which cannot be restored to factory-finished appearance. Use only materials and procedures recommended of furnished by locker manufacturer.

END OF SECTION

SECTION 10531 - ALUMINUM HANGER ROD CANOPY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The work covered by this section shall include furnishing and installing aluminum hanger rod canopy, with decking and fascia material. The canopy shall consist of structural aluminum panels bound by a framework of fascia which also acts as a water collecting gutter. All components shall be as required to support design loads in accordance with engineering prints and calculations provided by the manufacturer.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- C. Samples: Submit full range of color samples for each type of unit required.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following except as otherwise indicated.
 - 1. International Building Code, latest addition with amendments, if any. AWS (American Welding Society) standards for structural aluminum welding.
- B. Manufacturer: Obtain aluminum covered walkway system from only one (1) manufacturer, although several may be indicated as offering products complying with requirements.
- C. Installer Qualification: Firm with not less than three (3) years experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.
- D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work. However, allow for adjustments within specified tolerations wherever taking of field measurements before fabrication might delay work.
- E. Shop Assembly: Pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- F. Coordination: Furnish inserts and anchorages which must be built into other work for installation of rod canopy's and related work; coordinate delivery with other work to avoid delay.

1.5 PERFORMANCE REQUIREMENTS

- A. System Performance: Provide aluminum covered walkway system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:
- B. The system shall be designed by a registered Engineer in the State of Alabama, certifying the system meets all wind, foundation and all other applicable loads and requirements set forth by local or state building requirements.
 - 1. Live Load:
 - a. 30 p.s.f. minimum
 - 2. Structural design for wind forces:

- a. Comply with ANSI A58.1-1982
- 3. Design Wind Velocity:
 - a. 130 m.p.h.
- 4. Importance Factor:
 - a. 1.1.
- 5. Stability Criteria:
 - a. 2014 International Building Code
- C. Sizes shown on drawings are to be considered minimum.
- D. Structure shall be capable of sustaining severe icing, hail, hurricane force winds and supporting a concentrated load such as being walked upon.

PART 2 - PRODUCT

2.1 MANUFACTURERS

- A. The following manufacturers products have been used to establish minimum requirements for materials, workmanship, and function:
 - 1. Tennessee Valley Metals, Inc. **(Basis of Design and Standard or Quality)** | 190 Industrial Park Road, Oneonta, Alabama 35121 | (205) 274-9500 | www.tvmetals.com.
 - 2. Dittmer Architectural Aluminum | 1006 Shepherd Road, Winter Springs, Florida 32708 |(800) 822-1755; (407) 699-1755 | www.dittdeck.com; info@dittdeck.com.
 - 3. Superior Mason Products LLC. | 116 Citation Court, Birmingham, Alabama 35209 |(877) 445-1200 | www.superiormetalproducts.com; canopysales@superior-mason.com.
 - 4. Mitchell Metals | 1761 McCoba Dr. SE Suite B, Smyrna, Georgia 30080 | (770) 285-5875 | www.mitchellmetals.net; sales@mitchellmetals.net.
 - 5. Gulf South Metals | 17869 Samantha Drive, Foley, Alabama 36535 | (251) 943-6443; www.gulfsouthmetals.com; info@gulfsouthmetals.com.
 - 6. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. All aluminum extrusions shall be alloy 6063 heat treated to a T-6 temper.
- B. Standard finish for all components shall be satin anodize 204-R1 meeting Aluminum Association Specification AA-M-10C-22A-21.
- C. Fasteners:
 - 1. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.
 - 2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
 - 3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
 - 4. Tek Screws: not permitted

2.3 WARRANTY

- A. Manufacturer shall warrant the entire system against defects in labor and materials for a period of one (1) year commencing on the date of substantial completion as established in Division One of these specifications.
- B. Intention of this warranty is the manufacturer will come onto the jobsite and do all necessary to effect corrections of any deficiencies.

- C. Prima Facie Evidence of defects in labor and material may include but is not limited to, one or more of the following:
 - 1. Moisture leaks
 - 2. Metal failure including excessive deflection
 - 3. Fastener failure
 - 4. Finish failure

2.4 FABRICATION

- A. Comply with indicated profiles, dimensioned requirements and structural requirements.
- B. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.
- C. All welding do be done by heli-arc process.
- D. Bents shall consist of shop welded one piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.
- E. Mechanical joints shall consist of stainless steel bolts with a minimum of two (2) bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2" thick by 1 1/2" aluminum bolt bars welded to structural members. All such mechanical joints must be detailed on shop drawings showing all locations.
- F. Roof Deck: Flush deck extruded aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'- 0" to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.
- G. Expansion joints, design structure for thermal expansion and contraction. Provide expansion joints as required.
- H. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.
- I. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.
- J. Finish: Provide enameled finish on all components from manufacturers standards selected by Architect, fascia and related components designed for optimum performance in exterior installations under all environmental conditions. The finish shall be applied in accordance with and conform to, or exceed the Painted Sheet "Quality Standards" and recommended ASTM, Military and/or Federal Test Methods specified by the Aluminum Association in their publication "Aluminum Standards & Data" 1972-1973. Finishes shall be updated as necessary to conform to future editions of this publication.
- K. Component Accessories: Roof Brackets, Flashing, etc., shall be of similar materials and finishes as specified for prime components. Each part and its use is described in the engineering prints and calculations provided by the manufacturer. Each part shall be used as specified in the aforementioned prints. Posts shall be used as specified.
- L. Hanger rod shall be galvanized steel pipe with finish to match other components.
- M. Hardware: All bolts, nuts, washers, and screws used in joining the members of the canopy together shall be stainless steel up to 1/4" diameter nominal size. Any hardware 1/4" diameter and larger shall be hot dip galvanized to withstand 200 hours salt spray test of maximum resistance to rust and corrosion.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle covered walkway system components as recommended by manufacturer. Handle and store in a manner to avoid deforming members and to avoid

ALUMINUM HANGER ROD CANOPY
10531-3

New Gymnasium at Appalachian School
for the Blount County Board of Education
Oneonta, Alabama

excessive stresses.

3.2 EXAMINATION

- A. Examine adjacent work for conditions that would prevent quality installation of system.
- B. Do not proceed until defects are corrected.
- C. Installations:
 - 1. Installed units shall have the following minimum pitch for water drainage of the roof.
 - 2. Minimum pitch for all panels and fascia - Up to 10' - 1/8th/ft.
 - 3. Installed unit shall be properly caulked with a suitable, high quality material where needed and where specified.
 - 4. Installed unit shall meet local building code requirements and conform to the engineering prints provided by manufacturer.

3.3 FIELD DIMENSIONS

- A. General contractor shall field confirm bent locations, dimensions and elevations shown on shop drawings prior to fabrication.

3.4 CLEANING AND PROTECTION

- A. Damaged Units: Replace roof deck panels and other components of the work which have been damaged or have deteriorated beyond successful minor repair.
- B. Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

END OF SECTION

SECTION 10800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL

- A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 RELATED DOCUMENTS

- A. Section 06100, Rough Framing for Blocking

1.3 DESCRIPTION OF WORK

- B. Extent of each type of toilet accessory is indicated on drawings and schedules.
- C. **NOTE: Prior to placing any orders for items within this section, the General Contractor is responsible for verifying all toilet accessories with the Owner. Should the owner choose to provide/supply any of these toilet accessories, the General Contractor shall issue a deductive Change Order for material only. The General Contractor will maintain responsibility for installation.**
- D. Toilet Accessories **Furnished and Installed by the Contractor** as follows:
 - 1. Soap Dispensers
 - 2. Toilet Tissue Dispensers
 - 3. Grab Bars
 - 4. Mirror Units
 - 5. Utility Shelf/Mop Rack
 - 6. Handicapped shower seat
 - 7. Shower Rod
 - 8. Vinyl Shower Curtain
 - 9. Shower Curtain Hooks
 - 10. Double Robe Hook at Shower Units
 - 11. Electric Hand Dryers
 - 12. Feminine Napkin Disposal

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.
- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless other- wise acceptable to Architect.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturer's products have been used to establish minimum standards for materials, workmanship and function.
1. Soap Dispensers:
Wall Mounted over each sink
 - a. Approved Products:
 - i. Bobrick #B-2112
 - ii. ASI #0345
 - iii. Bradley #6562
 2. Toilet Tissue Dispensers:
 - a. Roll Type: (One each water closet)
 - b. Approved Products:
 - i. Bradley #5425
 - ii. ASI #0040
 3. Grab Bars:
 - a. Where shown on Plans with Safety-Grip Finish.
 - b. Approved Products:
 - i. Bradley Corporation #8122
 - ii. Series ASI #3200P
 - iii. Bobrick #B6806.99
 4. Mirror Units:
 - a. 18" x 38" One over each lavatory
 - b. 24" x 48" One at each Gang Toilet
 - c. Approved Products:
 - i. Bradley #780
 - ii. Bobrick #B290
 - iii. ASI #0600
 5. Utility Shelf/Mop Rack:
 - a. At locations indicated on drawings. If not indicated, provide One (1) at each Janitor Closet containing water closet. If location is not indicated, contractor is to coordinated location(s) with architect.
 - b. Approved Products:
 - i. ASI #1308-4 (44")
 - ii. Bradley #9934 (44')
 - iii. Bobrick #B239 x 44
 6. Handicapped Shower Seat:
 - a. Locations as Indicated on drawings
 - b. Approved Products:
 - i. Bobrick #B5181

- ii. Bradley #9565
 - 7. Shower Rod:
 - a. At each shower unit as indicated on the drawings, shower rod unit shall be polished stainless steel
 - b. Approved Products:
 - i. Bradley #9531-4
 - ii. ASI #1204
 - iii. Bobrick #B6047
 - 8. Vinyl Shower Curtain:
 - a. Curtain shall be 8 gauge vinyl fabric
 - b. 72" high
 - c. 6" wider than opening up to 48"
 - d. 12" wider than openings exceeding 48"
 - e. Color as selected by the architect after bid date from manufacturer standards.
 - f. Approved Products:
 - i. ASI #1200-V
 - 9. Shower Curtain Hooks:
 - a. Supply stainless steel hooks for each shower curtain as required
 - b. Approved Products:
 - i. ASI #1200-SHU
 - 10. Double Robe Hook:
 - a. At Shower Units
 - b. Finish: Polished stainless steel.
 - c. Approved Products:
 - i. Bradley #9125
 - ii. ASI #7345
 - iii. Bobrick #B-7672
 - 11. Electrical Hand Dryers:
 - a. As shown on Plans at Gang Toilets
 - b. Approved Products:
 - i. Excel – Hand Activated #HO-IW
 - 12. Feminine Napkin Disposals
 - a. Surface Mounted (One at each Toilet Compartment – Female Restrooms). Mount on opposite wall of toilet paper dispenser.
 - b. Approved Products:
 - i. Bobrick #B-270 (Stainless Steel)
- B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.
- B. Mirror Units: Mirror glass shall be FS DD-G-451, Type I, Class I, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FS DD-M-411. Mirror shall be provided in stainless steel frames.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 FABRICATION

- A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated; in obtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project.
- B. Furnish two keys for each lock.
- C. Surface Mounted Toilet Accessories General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- D. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing labels and protective coatings.

END OF SECTION

SECTION 11200 - GYMNASIUM EQUIPMENT

PART - GENERAL

1.1 SECTION INCLUDES

- A. Gymnasium Equipment:
 - 1. Overhead-supported basketball backstops.
 - 2. Basketball backstop winches.
 - 3. Basketball backboards.
 - 4. Basketball backboard padding.
 - 5. Basketball goals.
 - 6. Portable Basketball goals.
 - 7. Backstop Height Adjustment Units.
 - 8. Indoor Volleyball Systems.
 - 9. Indoor Volleyball Nets.
 - 10. Indoor Volleyball Sleeves & Cover plates.
 - 11. Indoor Volleyball Net Antennas.
 - 12. Indoor Volleyball Boundary Markers.
 - 13. Indoor Volleyball Judge's Platforms.
 - 14. Indoor Volleyball Protective Padding.
 - 15. Gymnasium control systems – Key Switches.
 - 16. Gymnasium control systems – Wiring.
 - 17. Gymnasium Wall Padding.

1.2 RELATED SECTIONS

- A. Division 5 (Division 05) Metals Sections: Structural steel and steel joists.
- B. Division 9 (Division 09) Finishes Section: Finish painting of factory-primed surfaces.
- C. Division 16 (Division 26) Electrical Section: Installing electrical power to operate gymnasium equipment.

1.3 REFERENCES

- A. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM F 2440 – Standard Specification for Indoor Wall/Feature Padding.
- C. Federal Standard 191 – Textile Test Methods.
- D. NFPA 101 – Life Safety Code.
- E. NFPA 255 – Surface Burning Characteristics of Building Materials.
- F. NFPA 286 – Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- G. NFPA 701 – Methods of Fire Tests for Flame-Resistant Textiles and Films.
- H. UL 214 – Test for Flame-Propagation of Fabrics and Films.

1.4 DESIGN REQUIREMENTS

- A. Basketball Backstops: Locate overhead attachments of basketball backstops in keeping with static equivalent loading and point reactions.

1.5 SUBMITTALS

- A. Comply with Section 01330 (01 33 00) – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.
- C. Shop Drawings:
 - 1. Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating locations, quantities, dimensions, tolerances, materials, fabrication, connections, hardware, fasteners, finish, electrical wiring diagrams, options, and accessories.
 - 2. Show location and detail of attachment to building structure.
- D. Samples: Submit manufacturer's color samples.
 - 1. Basketball backboard padding.
 - 2. Wall wainscot padding.
- E. Design Data:
 - 1. Basketball Backstops:
 - a. Submit manufacturer's design data, indicating static loads and point reactions.
 - b. Submit calculations complete, showing hanger and hoist pulley points.
 - c. General load charts or generic product laboratory test data will not be considered sufficient data.
- F. Test Reports: Submit manufacturer's certified test reports from testing performed by accredited independent testing laboratory, indicating compliance of materials with requirements as specified.
- G. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- H. Manufacturer's Project References: Submit manufacturer's list of recently completed projects, including project name and location, name of architect, and type and quantity of gymnasium and play field equipment installed.
- I. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; parts list; and electrical wiring diagrams.
- J. Warranty: Submit manufacturer's standard, lifetime, and additional warranties.

1.6 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide gymnasium equipment from single manufacturer.
- B. Manufacturer's Qualifications: Minimum of 5 consecutive years experience manufacturing gymnasium and play field equipment similar to that specified.
- C. Installer's Qualifications: Trained and approved by manufacturer.
- D. Regulatory Requirements: Gymnasium equipment shall conform to latest rules and regulations.
 - 1. Federation Internationale de Football Association (FIFA).
 - 2. International Basketball Federation / Federation International de Basketball (FIBA).
 - 3. National Association for Girls and Women in Sport (NAGWS).
 - 4. National Basketball Association (NBA).
 - 5. National Collegiate Athletic Association (NCAA).
 - 6. National Federation of State High School Associations (NFHS).
 - 7. USA Volleyball (USAV).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions. Keep temporary protective coverings in place.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.8 WARRANTY

- A. Provide 1-year warranty against defects in materials and workmanship, unless otherwise specified.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Porter Athletic, Inc. [Basis of Design] | 601 Mercury Drive, PO Box 1790, Champaign, Illinois 61824-1790. | Phone (217) 367-8438. Fax (217) 239-2255. | www.porterathletic.com.
- B. Spalding Equipment [Portable Basis of Design] P.O. Box 90015 Bowling Green, Kentucky 42103 | Phone (800) 772-5346 | www.spaldingequipment.com. 401-990 Arena.
- C. Jaypro Sports, LLC. | 976 Hartford Tpk, Waterford, CT 06385 | PH: 800-243-0533 (Toll Free) | 860-447-3001 | www.jayprosports.com.
- D. Draper, Inc. | 411 South Pearl St., Spiceland, Indiana 47385 | 765-987-7999 | 800-238-7999 | www.draperinc.com.
- E. Performance Sports System | 9200 E 146th St. | Noblesville, Indiana 46060 | (317) 774-9840 | www.perfsports.com.
- F. AALCO Manufacturing | 1650 Avenue H St. Louis, MO 63125 | 314-544-4300 | 314-544-4300 | email: sales@aalcomfg.com | www.aalcomfg.com.
- G. Equal products of other manufacturers may be used in the work provided, such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 OVERHEAD-SUPPORTED BASKETBALL BACKSTOPS

- A. **Model No. 917 - Forward Fold / Rear Braced / Overhead Supporting**
 - 1. Refer to drawings for Location(s) and Quantities.
 - 2. Fully welded, vertical front frame assembly consisting of main center mast of 6-5/8-inch O.D. heavy-wall structural steel tube with diagonal side sway braces of 2-1/2-inch rectangular steel tube. Bolt-together frames are not acceptable.
 - 3. Ends of Diagonal-Brace Tubes and Internal Web Bracing: Precision machine-cut to provide maximum weld surface contact to form unitized, back-to-back, triangular-type structural design to provide superior lateral stability.
 - 4. Top Horizontal Mast Hinge Spreader: Heavy 4-inch structural steel channel.
 - 5. Backstop: Supported from 3-1/2-inch O.D. pipe anchored to overhead framing members with heavy formed-steel support fittings. Capable of supporting load exceeding 10,000 pounds with sufficient attachment points and meeting safety factor of 60 to 1. Furnish certified test results with submittals.
 - 6. Goals: Mount directly through backboard and into heavy structural steel weldment Center-Strut, clamped to vertical 6-5/8-inch O.D. center support to eliminate strain on backboard, should player hang on front-mounted goal and to be in compliance with NCAA and NFSHSA requirements.
 - 7. Fittings: Attached to 6-5/8-inch O.D. vertical drop tube by heavy 1/4-inch thick precision

saddle die-cut formed-steel fittings secured in place by 5/8-inch diameter U-bolt hardware.

8. Upper Backboard Extension Assembly: Provide official NCAA and NFSHSA regulation 6 inches from front of Center-Strut to face of backboard.
9. Main Backstop Frame Assembly: Suspended from overhead 3-1/2-inch O.D. pipe by adjustable hangers, with 2 inches of vertical adjustment, to provide for precise plumbing of frame during installation.
10. Hangers: Tested to 20,000 pounds maximum breaking point to achieve safety factor of 50 to.
 1. Furnish certified test results with submittals.
11. Support Hangers: Offset 1-1/2 inches from center line of main center mast to properly weight lock unit in playing position.
12. Backstop: Operate with 1-7/8-inch O.D. front-brace assembly with folding-knee joint.
13. Knee Joint: Lock backboard in playing position, with torsion spring within hinge assembly.
14. Hoist Cable: Disengage knee joint, allowing front brace to fold.
15. Backstop 6-5/8-Inch O.D. Main Stem: Suspended diagonally from superstructure with 15 degree angle and 4'-6" long vertical member for attachment of basketball backboard.
16. Rear Diagonal Back-Brace Assembly: Heavy-wall 1-7/8-inch O.D. pipe with internal telescoping-tube arrangement.
17. Adjustable Collar: Permanently set during installation to plumb face of backboard and to level goal.
18. Finish of Metal Parts, Pipes, and Fittings: Flat enamel, 1 coat. Color to be selected by Architect from manufacturers standards.

B. Model No. 955 - Side Folding / Side Braced / Overhead-Supporting

1. Refer to drawings for Location(s) and Quantities.
2. Vertical Frame Assembly: Main vertical support of 6-5/8-inch O.D. heavy-wall structural tube with rear diagonal brace of 1-7/8-inch O.D. structural pipe. Suspended by adjustable hangers, with 2-inch adjustment, to provide for precise plumbing of frame during installation, and further supported from 3-1/2-inch O.D. pipe anchored to overhead framing system by heavy, formed, die-cut steel support fittings.
3. Top Horizontal Mast Hinge Spreader: Heavy-wall 3-1/2-inch O.D. tubing to form rigid triangular design.
4. Goal: Mount directly through backboard and into heavy structural steel weldment clamped to vertical 6-5/8-inch O.D. center support to eliminate strain on backboard, should player hang on front-mounted goal. Direct-mount feature shall conform to NCAA rules. Transfer load on goal directly to backboard support Center-Strut, to minimize stress to glass backboard.
5. Upper Backboard Extension Assembly: Official NCAA and NFSHSA regulation 6 inches from front of Center-Strut to face of backboard.
6. Support Fittings: Attached to overhead framing. Capable of supporting load exceeding 10,000 pounds, with sufficient attachment points to acquire 60:1 safety factor for support of entire backstop superstructure system. Furnish certified test results with submittals.
7. Superstructure Pipes: Reinforced with truss-type bridging or bracing when truss centers exceed spans of 14'-0", as required.
8. Pipe Ends: Cap when exposed.
9. Backstop: Operate with 1-7/8-inch O.D. side-brace assembly for proper adjustment during installation.
10. 1Knee Joint: Locks backboard in playing position with torsion spring within hinge assembly. Disengaged by upward force of hoist cable.

11. Finish of Metal Parts, Pipes, and Fittings: Flat enamel, 1 coat. Color to be selected by Architect from manufacturers standards.

2.3 BASKETBALL BACKSTOP WINCHES

A. Basketball Backstop Winches, General:

1. Hoist Cable: Of sufficient length to each backstop. 1/4-inch diameter galvanized aircraft-type cable, minimum of 7,000 pounds ultimate.
2. Swivel Pulleys: 4-inch diameter cast ductile iron pulley sheave with maintenance-free, oil-impregnated bearing for proper hoist cable routing to winch.
3. Pulley Assembly and Attachment to 3-1/2-Inch O.D. Support Structure: Rated at minimum 9,000-pound load rating. Furnish certified test results with submittals.

B. Standard-Duty Electric Winches: Model No. 712.

1. For each backstop.
2. Hold units at any position when raising or lowering.
3. Electric Motor: Individually operate units by 3/4-hp, 13-amp, capacitor-type, 60-cycle, 110-V AC, single-phase, electric motor with automatic thermal-overload protection, manufactured to NEMA specifications.
4. Fully Enclosed Gear Set: Set in oil bath and factory sealed to eliminate need for lubrication.
5. Cable Drum: Grooved to provide neat and consistent cable tracking.
6. Gear Shaft: Connect directly to drum hoist without use of chain.
7. Electric Winch: Incorporate rotary up and down limit switches and flush wall-mounted dual-key (separate up and down keys) switch to prevent improper operation of system.
8. Key Switches: Key switches, operating basketball backstops and gymnasium dividers, shall be furnished identical.

C. Safety Locks: Model No. 797 Saf-Strap safety lock.

1. For each court backstop.
2. Lock: Inertia sensitive to automatically lock basketball backstop in position at any time in storage or during raising or lowering cycle, due to sudden surge of speed created by possible malfunction of hoisting apparatus.
3. Reset: Fully automatic reset requiring no poles, ropes, levers, or buttons.

2.4 BASKETBALL BACKBOARDS

A. Basketball Backboards: Model No. 208 rectangular backboard.

1. Provide for each 917 and 955 back-stop.
2. Backboards: 2-5/16-inch thick frame, 72 inches by 42 inches, 1/2-inch tempered plate glass cushioned in unitized steel-tubing frame.
3. Perimeter: Glare-free aluminum.
4. Standard White Borders and Target Area: Fired into glass permanently.
5. Warranty: Limited lifetime warranty against breakage.

2.5 BASKETBALL BACKBOARD PADDING

A. Basketball Backboard Padding: Model No. 326 Pro Pad bolt-on positive-attachment backboard pad.

1. Provide for each rectangular glass backboard, along bottom of backboard and up 15 inches on each side, meeting NCAA and NFHS rules.

2. Pads: 2-inch thick, molded from 9-pound density polyurethane foam with integral skin.
3. Color: To be selected by Architect from manufacturer standards. Gray, Scarlet, Royal, Navy, Kelly, Forest Green, Maroon, Orange, Black, Purple, and Gold
4. Warranty: 8 years.

2.6 BASKETBALL GOALS

- A. **Basketball Goals: Model No. 236054 Ultra – Flex II Goal [Breakaway Goal]**
 1. Provide for each Model No. 208 backboard.
 2. Goal: Positive-lock, pressure-release mechanism which is preset to provide rebound characteristics identical to those of a non-movable ring. Spring-loaded to automatically and instantaneously return to playing position.
 3. Pressure Release Mechanism: Factory preset with capability for field adjustment to comply with NCAA recommendation to test goals for rebound elasticity.
 4. Breakaway goals with plastic-pivot bearings are not acceptable.
 5. Rim: 18 inch diameter, made with 5/8 inch diameter cold drawn, alloy steel, rigidly braced by 3/16-inch thick steel formed and die-cut steel brace welded in position on underside of rim for maximum support.
 6. Net Attachment: Tube-tie net attachment system on rim to eliminate conventional wire-formed net locks.
 7. Net: Anti-whip, white net.
 8. Finish: Official orange powder coated.
- B. **Portable Basketball Goals: Spalding Model No. 401-990 Arena Backstop-Spring Assist with 10'-8" extension**
 1. Provide for each regulation Superglass Pro Backboard, Slam-Dunk Precision 180 Goal.
 2. E-Z Bolt Backboard Padding.
 3. Custom Frame
 4. Net and Net attachment as required.
 5. Padding Colors as selected by Architect.

2.7 HEIGHT ADJUSTMENT UNITS

1. **Model No. 00900xxx** for each backstop, height adjustment unit for adjusting goal height to any position between 8'-0" and 10'-0" above floor, with Center-Strut direct-goal attachment to eliminate strain on backboard.
2. Height Scale: Located on side of slide tube to visually determine height settings.
3. Guide Tubes: Fabricated with dual, 2-3/16-inch square, heavy-wall, zinc-plated, guide tubes. Tubes to be welded to upper and lower clamps that attach securely to 6-5/8-inch diameter backstop mast. Tubes shall support heavy steel center weldment, which shall support backboard and be factory drilled for direct goal attachment.
4. Warranty: Limited lifetime warranty against breakage for backboards mounted on height adjustment unit.
5. Height Locking Device: Automatically engages when hand crank is removed.
6. Unit shall operate by 3/4-inch diameter Acme-threaded rod and removable hand crank.
7. Include Height Adjuster Crank.

2.8 INDOOR VOLLEYBALL

- A. **Volleyball System: Model No. 01991000 Powr-Line Competition volleyball system.**
 1. Quantity: Provide as indicated on the drawings.

2. Posts: Telescoping type that does not extend above net and impede official's vision.
 3. Post Material: 3-1/2-inch diameter, Alloy 6063-T6 aluminum extrusion with reinforcing rib pattern. Finished with plastic-molded foot to protect against gymnasium floor damage.
 4. Upper Telescoping Upright: Extruded from same aluminum alloy as bottom upright. Height adjustable for heights from 6'-1" to 7'-11-5/8" with pressure-lock T-handle assembly. Counterbalanced with constant-tension spring mechanism to eliminate possibility of accidentally falling while making height adjustments.
 5. Upper End of Upright: 3-inch diameter pulley to reduce cable drag and unnecessary system tension.
 6. Winch Post: Heavy-duty Powr-Winch®.
 7. End Post: Heavy-duty collar assembly for net tie-off.
 8. Powr-Winch®: Heavy-duty, self-locking ratchet with disc-brake release mechanism for safest tensioning system. 1-3/4-inch wide, high-tensile nylon strap and durable snap hook. Removable handle to prevent unauthorized use.
 9. Height Indicator Labels: Apply after assembly of posts.
 10. Each System: Consists of 1 winch post and 1 end post.
 11. Finish: Clear anodized.
- B. **Volleyball Nets: Model No. 02295640 volleyball net.**
1. Provide at each Volleyball System.
 2. Nets: 32 feet by 39 inches with 42'-6", 1/4 inch diameter nylon braided cord with a Kevlar core. Use with Model No. 01991 competition standards.
 3. End Hems: 4-inch width with 1/2-inch diameter fiberglass dowel to provide rigidity and tailored square hanging net.
 4. Each End Hem: Equipped with three 1-inch wide polypropylene web-tension straps and quick-adjust tension clips.
 5. Netting: 4-inch square, heavy-duty, #24 black nylon mesh with 2-inch wide, vinyl-coated, polyester hem double-stitched across top of net.
- C. **Floor Sleeves and Cover Plates: Model No. 00870100 floor sleeve.**
1. Provide: As indicated on drawings.
 2. Floor Sleeve: 3-3/4-inch O.D. heavy-wall steel tubing, extending 9 inches into concrete footing.
 3. Cover Plate: Brass plated. 5-inch O.D. by 1/2-inch thick recessed collar, cork gasket, and cover.
 4. Swivel Retainer Pin in Collar: Prevent theft.
 5. Cover removal key.
- D. **Net Antenna: Model No. 02296100 Powr-Line net antenna with clamp.**
1. Provide One (1) Set at each Volleyball System.
 2. Antenna Clamps: Included with net antenna. As 1 complete unit, clamps shall snap easily and securely into place.
 3. Antenna Size: 3/8-inch diameter by 6-foot long fiberglass dowels. Check no spec measurements
 4. Antenna Markings: Alternately marked red and white.
- E. **Boundary Markers: Model No. 02297 boundary markers.**
1. Provide One (1) Set at each Volleyball System.

2. 2-inch wide, durable, white, polyester-reinforced vinyl material with white Velcro attachment strips sewn in place for securing to competition volleyball net.

F. **Judge's Platforms: Model No. 00999000 judge's platform.**

1. Provide One (1) at each Volleyball System.
2. Attach to volleyball system in cavities of post.
3. Platform Size: 23-5/16 inches square, at height of 3'-10" above playing floor.
4. Platform Support Side Frames: Formed 1-5/16-inch O.D. steel tube handrail/ladder sections.
5. Casters: 2, for ease of moving.
6. Protective Pads: Model No. 00993100.

G. **Protective Padding: Model No. 00839000 protective padding.**

1. Provide at each Volleyball System.
2. Compliance: Meet current competition requirements as prescribed by USAV, NFHS, and NCAA for player protection and safety.
3. Padding: Extend to height of 6'-0".
4. Construction: Fabricated with a firm, 1-1/2-inch thick closed cell polyethylene foam covered in durable vinyl coated polyester.
5. Pads Installed on Uprights: Narrow profile to provide for maximum visibility for judges and spectators.
6. Color: Custom colors available.
7. Net Attachment: One side of pad has cut-out to accommodate net attachment.

2.9 GYMNASIUM CONTROL SYSTEMS

A. **Key Switches: Model No. XELE007911xx**

1. Wall-Mounted Dual-Key Switch: Switch with separate "up" and "down" keys to prevent improper operation of system. Single key systems or "toggle" type switches are not approved. Operates quantity of winches required.
2. Momentary Switch: Switch automatically returns to "off" position if released.
3. Cover Plate: Flush-mounted stainless steel cover plate with manufacturer's label including operating instructions.
4. Key Switches: Key switches for all gymnasium equipment to be furnished identical.

B. **Wiring: Install electric power and hook-up of electric controllers.**

1. Materials: Conduit, wire, and boxes for power and control of key switches, touch pad, and motors to be furnished and installed as specified in Division 16 (Division 26) electrical section.
2. Hook-Ups: Complete and final hook-up of motors and electrical devices as specified in Division 16 (Division 26) electrical section.

2.10 GYMNASIUM WALL PADDING

A. **Model No. 560 DuraSafe Wall Pad.**

1. Shock Absorption: ASTM F 2440, meet minimum standard.
 - a. The Maximum gMAX values for the padding shall not exceed 200 and the HIC shall not exceed 1000 when tested at a 4 foot Drop Height.
2. Cover Material: Designated as flame resistant in accordance with NFPA 701 and State of California.

3. Wall Pad Dimensions: 2'-0" wide by 6'-0" high by 2" thick.
4. Nailing Margin: 1-inch nailing margin top and bottom for securing panels to wall.
5. Foam: 2 inch thick polyethylene foam.
6. Interior Foam: Bonded to 7/16-inch OSB to minimize warping.
7. Entire Face of Panel, Including Nailing Margins: Upholstered in 19-ounce, fire-retardant, high-tensile, vinyl-coated polyester fabric material with leather-like embossed finish.
8. Cover Material Tear Strength: 100 psi.
9. Cover Material Properties: Mildew resistant, rot resistant, with infection-combating fungicide.
10. Fold and securely staple cover to backside of OSB.
11. Color: To be selected by Architect from manufacturer standards after bid date.
12. Column Pads: Same construction as wall pads mounted on 3/4" plywood backing mounted to columns. Equal to Aalco Model #CCP-1. Height of column pads shall be 8'-0" high. Color to match wall pads.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and supporting structure to receive gymnasium and play field equipment. Notify Architect in writing of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install gymnasium and play field equipment in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install equipment plumb, level, straight, square, accurately aligned, correctly located, to proper elevation, and secure.
- C. Install equipment using manufacturer's supplied hardware and fasteners.
- D. Electrical: Install electrical power as specified in Division 16 (Division 26) electrical section.
- E. Wall Padding: Form or cutout panels for columns, electrical outlets, wall switches, and other items as required.
- F. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- G. Remove and replace damaged components that cannot be successfully repaired, as determined by Architect.

3.3 ADJUSTING

- A. Adjust basketball backstops, backboards, and goals for plumb and level.
- B. Adjust operating equipment to function properly and for smooth operation without binding.
- C. Set and adjust electric winch upper and lower limit controls.

3.4 CLEANING

- A. Clean gymnasium and play field equipment promptly after installation in accordance with manufacturer's instructions.
- B. Remove labels and temporary protective coverings.
- C. Do not use harsh cleaning materials or methods that would damage finish.

3.5 DEMONSTRATION

- A. Demonstrate operation and maintenance of gymnasium and play field equipment to Owner's

personnel.

- B. Furnish Owner with keys to equipment after demonstration.

3.6 PROTECTION

- A. Protect installed gymnasium and play field equipment to ensure equipment will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 11450 – APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. This section includes:

- 1. **Owner Furnished-Owner Installed Equipment:**

- Where indicated on drawings, the Owner will furnish equipment items and the General Contractor shall install and make final electrical, mechanical and plumbing connections.

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings as per requirements. Drawings shall show schedules showing location and sizes, and complete details.
- B. Owner's Manuals: Contractor shall insure that owner's manuals and other data packed with the equipment is turned over to the Owner's representative after installation is completed.

1.4 GUARANTEE

- A. All equipment shall be guaranteed to be free from defects of workmanship of materials for a period of one year from date of acceptance.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Contractor Furnished-Contractor Installed Equipment:

- 1. Range

- a. Maytag **Model MER660FZ**, 30", 5.3 cu. ft., Smooth Surface, 5-Element, Self Cleaning, Free-Standing Electric Range; Fingerprint resistant stainless steel; Precision Cooking System; Variable Broil; Shatter Resistant Cooktop; Sealed hidden bake element; 10 year limited parts warranty on glass cooktop, elements and cavity.
 - b. GE Model #JB250DFWW, 30", 5.3 cu. ft., free-standing electric range, provide all electrical cords, self clean, top heating elements

- 2. Range Hood:

- a. Broan 41000 Series (Basis of Design); www.broan.com.

- I. Range hood shall be non-ducted and have a non-ducted filter.
 - II. Motor to be permanently lubricated. RPM not to exceed 2850.
 - III. Unit shall have a two-speed fan switch and separate light switch.
 - IV. Sides shall be mitered and bottom edge hemmed with no sharp edges.
 - V. Unit shall be U.L. listed
 - VI. 120 Volts; 2.0 amps.; 2850 RPM.
 - VII. Provide up to 75W bulb in each unit.
 - VIII. Size: See Drawings
 - IX. Color: Stainless Steel

- b. GE Model #JV347HWW, deluxe range hood, 6" high, 29" wide, 17" deep, convertible vent, 3 speed, removable grease filter, cooktop light, upfront controls

3. Refrigerator / Freezer:
 - a. Maytag **Model MRT118FFFZ**, 18.2 cu.ft. capacity, Top-freezer Refrigerator; Fingerprint Resistant Stainless Steel; BrightSeries LED lighting; Freshlock crispers; Up-front electronic temperature controls; 10 year limited parts warranty on compressor; 65.81" high, 29.75" wide, 31.375" deep.
 - b. GE Model #GTE16GTHWW, 15.5.0 cu. ft. capacity, top freezer, frost free, energy star rated, 66" high, 28" wide, 31" deep
 - c. GE Model #GTH18EBEWW, 18.0 cu. ft. capacity, top freezer, frost free, energy star rated, 66" high, 29" wide, 32" deep. **ADA compliant**
4. Undercounter Refrigerator/Mini Fridge:
 - a. GE **Model GCE06GSHSB**, 5.6 cu.ft. capacity, Built-in/Free-standing Mini Refrigerator; Stainless Steel; 5.12 Fresh food capacity with .49 cu.ft. freezer capacity; Interior lighting; Temperature Control; 2 shelves; Door Shelves; Recessed Handles; 1 year limited entire appliance warranty. 34.13" high, 23.63" wide, 23.75" deep.
5. Dishwasher
 - a. Maytag **Model MDB4949SHZ**, Hard Food Disposer Built-In Dishwasher; Fingerprint Resistant Stainless Steel; 4-blade stainless steel chopper; Powerblast Cycle; Heated Dry ups Temperatures; Touch Controls; Stainless Steel Tub; Premium DuraGuard nylon racks with heavy duty coating; 10 year limited parts warranty on racks, chopper blade and stainless steel tub.
 - b. GE Model GSD2101VWW, 4 level wash, upfront controls, 5 cycles
6. Microwave
 - a. **GE Model #JVM3150DFWW** 1.5 cu. ft. capacity countertop model, 16" high, 30" wide, 15" deep, 1150 watts, turntable, electronic touch
 - b. **GE Model #JES1460DSWW**, 1.4 cu. ft. capacity countertop model, 13" high, 22" wide, 18" deep, 1150 watts, turntable, electronic touch
7. Washer
 - a. Maytag **Model MVWC565FW**; 4.2 cu.ft. High-Efficiency Top Load Washer; White; Powerwash cycle; Deep Rinse Option; Maytag Commercial Technology; 10 year Limited Parts Warranty on Direct Drive Motor and Wash Basket; 42" high, 27.5" wide, 27" deep.
 - b. GE Model #GFWH1200DWW, 3.6 DOE cu. ft. stainless steel basket, frontload washer, ADA compliant, energy star rated, 40" high, 27" wide, 34" deep
 - c. **With** a GE Frontload Storage Pedestal GE Model #SBSD137H, 15" high, 27" wide, 29" deep.
8. Dryer
 - a. Maytag **Model MEDC465HW**; 7.0 cu.ft. Electric Dryer; White; Heavy Duty Motor; IntelliDry sensor; Maytag Commercial Technology; 10 year Limited Parts Warranty on Drive Motor and Dryer Drum; 43" high, 29" wide, 28.25" deep
 - b. GE Model #GFDN120EDWW, 7.0 cu. ft. frontload dryer, 40" high, 27" wide, 33" deep, ADA compliant. Each unit shall be furnished
 - c. **With** a GE Frontload Storage Pedestal GE Model #SBSD137H, 15" high, 27" wide, 29" deep
9. Garbage Disposal
 - a. InSinkErator Evolution Model SPACE SAVER; 5/8-HP Continuous Feed; 1725 RPM Motor; 34.6 Oz. capacity grind chamber; Quite Performance SoundSeal Technology; MultiGrind Technology; 4 year limited parts and labor warranty.

- B. Equal products of other manufacturers may be used in the work provided, such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Equipment shall be installed in strict accordance with manufacturer's recommendations.
- B. Clean up: Contractor shall remove all packing, blocking, protective coatings and tapes after installation. Wash down exterior of units with mild detergent and water.

END OF SECTION

SECTION 11900 – ATHLETIC TRAINING TABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Provide Training Tables as indicated on the drawings, complete with all devices and accessories.

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings as per requirements. Drawings shall show schedules showing location and sizes, and complete details.
- B. Samples: Submit fabric samples, 12" x 12", which show materials as proposed on this project.

PART 2 – MATERIALS

2.1 MANUFACTURERS

- A. Hausmann Industries | 130 Union Street | Northvale, New Jersey 07647 | Ph.: 201.767.0255 | www.hausmann.com.
- B. Equal products of other manufacturers may be used in the work provided, such products have been approved, by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 MODULAR TAPING STATIONS

- A. Proteam Modular Taping Stations
 1. Model No. A9523 with Side Cabinet Extension.
 2. Type: 2 Seat Taping Station
 3. **Quantity: 2 Required**
 4. All Locks for drawers and cabinets shall be keyed alike.
 5. All drawers shall be self-closing laminate drawer with nylon rollers.
 6. Doors shall have concealed, adjustable, self-closing 110 degree euro-hinges.
 7. 42" High X 36" Deep. See drawings for length and layout.
 8. Black Laminate Finish
 9. Black Upholstered Taping Tops.
 10. Door and drawer fronts shall have 3mm high impact edging.
 11. Removable 2" thick high density foam upholstered tops.
 12. Color and Finish to be selected by Architect from manufactures standards after bid date.
 13. Include the following accessories:
 - a. One (1) Waste Hamper and Cut Out - Model No. A924
 - b. Four Drawer Locks - Model No. A945
 - c. Five Cabinet Locks/Bolts - Model No. A946
- B. Proteam Cabinet Style Split Leg Lift Tables
 1. Model No. A9068 - Cabinet Style Split Leg Lift Table.
 2. Quantity: 2 Required
 3. 78" long X 30" Wide X 31" High

4. Black Laminate Finish
5. Black Upholstered Taping Tops.
6. All Locks for cabinets shall be keyed alike.
7. Doors shall have concealed, adjustable, self-closing 110 degree euro-hinges
8. Door fronts shall have 3mm high impact edging.
9. Removable 2" thick high density foam upholstered tops.
10. Finish as selected by Owner from manufactures standards.
11. Add the following accessories:
 - a. Adjustable Spring Backrest with single lever activation locks into any position up to 75°- Model No. 69
 - b. Three cabinet Locks/Bolt - Model No. A946
 - c. All locks for drawers and cabinets should be keyed alike.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

- A. Replace damaged or defective items.

END OF SECTION

SECTION 12500 - WINDOW TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. The extent of window treatment is indicated on drawings and in schedules. Types of window treatment work in this section include:

- 1. 2" Horizontal Faux Wood Slat Blinds and operating hardware.

- B. Location: All exterior windows.

1.3 QUALITY ASSURANCE

- A. General: Provide window treatment units which are complete assemblies produced by one manufacturer for each type required, including hardware, accessory items, mounting brackets, and fastenings.
- B. Furnish materials in colors and patterns as indicated, or, if not indicated, as selected by Architect from manufacturer's standard colors/patterns.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.4 REFERENCE STANDARDS

- A. WCMA A100.1 - Safety of Corded Window Covering Products; Window Covering Manufacturers Association; 2010. (ANSI/WCMA A101.1)

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of window treatment unit required. Include methods of installation for each type of opening and supporting structure.
- B. Shop Drawings: Submit shop drawings for special components and application conditions of window treatment units which are not fully dimensioned or detailed in manufacturer's product data. Show relationship to adjoining work.
 - 1. Include typical elevation layout indicating proposed division between blind units and meeting edges at corners. Provide sections and details at head and sill between blind units and corners including inclined installations.
 - 2. Provide schedule of all units to be furnished, including field measurements at each location.
- C. Samples: For selection of colors, submit manufacturer's color charts consisting of sections of exposed components with integral or applied finishes showing full range of colors, materials, etc. available for each type of window treatment assembly required.

1.6 WARRANTY

- A. Products shall be manufactured exempt of any sharp edges, burrs, or other defects.
- B. Provide manufacturer's limited lifetime warranty on head rail and other components.
- C. Provide 5 year manufacturer's warranty for slats.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:

1. CACO, Inc. Window Fashions; www.cacoinc.com; 119 Perma R Rd., Johnson City, TN 37604; PH: 1.800.552.5278
 2. Bali; www.baliblinds.com; 8467 Route 405 Highway South, P.O. Box 500, Montgomery, PA 17752; Phone: 877.792.0002
 3. Levolor; www.levolor.com; 3 Glenlake Parkway NE, 10th Floor, Atlanta, GA 30328; 1.800.752.9677
 4. Graber Industries, Inc.; www.graberblinds.com; 8467 Route 405 Highway South, P.O. Box 500, Montgomery, PA 17752; Phone: 877.792.0002
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect not less than Ten (10) days prior to scheduled bid opening.

2.1 BLINDS AND BLIND COMPONENTS

- A. Head Rail:
1. U shaped configuration
 2. 2 1/2" deep by 2" high with rolled edges at the top.
 3. Fabricate from 0.024 inch thick iron phosphate treated steel.
 4. Acrylic primed with a finish coat of baked on polyester enamel in color selected by Architect.
 5. Provide reinforcing end caps in color to match head rail.
- B. Slats:
1. Extrude to a flat rigid form from PVC foam.
 2. Provide an anti-static dust inhibiting coating to surface to minimize dust accumulation.
 3. Nominal Width: 2 inches wide
 4. Nominal Thickness: .122 inches
 5. PVC foam to meet or exceed requirements of NFPA 701.
- C. Bottom Rail:
1. Profile: Trapezoidal
 2. Nominal Thickness: 7/8 inches
 3. Nominal Width: 2 inches
 4. Fabricate from extruded PVC, finish to match slats.
- D. Valance:
1. Provide manufacturer's standard valance.
 2. Nominal Thickness: 3/8 inch
 3. Nominal Width: 2 1/2 inches

2.2 ACCESSORIES

- A. Tapes and Ladders:
1. Standard color coordinate braided ladders shall be constructed of polyester yarn with a double crossed inter-braided cable thread design.
 2. Supported ladder ladders using ladder tape without any visible distortion.
 3. Ladder rung distances shall not exceed 44mm.
 4. Distances between ladders shall not exceed 12-inches.
 5. Distance from end of ladder to end of slat shall not exceed 5-inches.

- B. Tape Rolls and Supports:
 - 1. Fabricate from low friction thermoplastic which are self lubricating and maintenance free for smooth operation and diminished wear on lift cords and braided ladders.
 - 2. Tape rolls shall be designed to hold tape end by means of a "U" shaped brass grommet which shall be inserted into tape rolls, allowing for a more precise placement of ladders when secured.
 - 3. Tape rolls shall include a projecting thermoplastic cylindrical collar integrated on each end. Tilt rod is centered though both tape drum and collar project.
 - 4. Self lubricating thermoplastic collars are designed to snap securely into tape drum supports for near effortless tilting operation.
- C. Crash Proof Cord Lock:
 - 1. Snap-in design with nylon roller. Provided a secured steel roller on a hinged lock to facilitate "crash-proof" feature.
- D. Tilt Wand:
 - 1. Standard wand tilter.
 - a. Self-lubricating thermoplastic worm and gear mechanism with fully encased plastic housing.
 - b. Color coordinate plastic.
 - c. 3/8" diameter
 - d. Length as required to coordinate with window sizes.
 - e. Provide corrosion resistant metal clip for attachment of wand to tilter shaft.
- E. Lift Cords:
 - 1. Color coordinate lift cords constructed of braided polyester jacket with a rayon center core.
 - 2. Provide in lengths required to properly facilitate the raising and lowering of blinds.
 - 3. 1.8mm diameter.
 - 4. End Support Brackets:
 - 5. Galvanized steel bracket with riveted hinged cover.
 - 6. Nominal thickness: 0.038 inch
 - 7. Baked polyester enamel finish.
 - 8. Color to coordinate with blind assembly.
 - 9. Coordinate bracket anchorage with jamb and sill conditions.

2.3 FABRICATION AND OPERATION

- A. Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust dimensions for proper fit at openings. Cooperate with other trades for securing tracks to substrates and other finished surfaces.
- B. Fabricate window treatment components from non-corrosive, non-staining, non-fading materials which are completely compatible with each other, and which do not require lubrication during normal expected life.
- C. Fabricate blind units to completely fill the openings as shown, from head-to-sill and jamb-to-jamb.
- D. For continuous window wall installations, fabricate blinds so that ends occur only over mullions or other defined vertical separation, unless otherwise indicated.
- E. Space supporting ladders to comply with manufacturer's standards, unless otherwise indicated.
- F. Space louver blades to provide a minimum overlap of 3/8" for light exclusion when in fully-closed

position. Gear operating equipment for reduction of the ratio of hand-movement to louver position, so that blinds operate easily and can be set accurately and smoothly.

- G. Equip horizontal blind units, unless otherwise indicated for the following operation.
 - 1. Full-tilting operation with slats rotating approximately 180° . Place tilt operating controls on left-hand side of blind units, unless otherwise indicated.
 - 2. Full-height raising to manufacturer's minimum stacking dimension, with lifting cord locks for stopping blind at any point of ascending or descending travel.
 - 3. Place pull cords on right-hand side of blind units, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install window treatment units in manner indicated to comply with manufacturer's instructions. Position units level, plumb, secure, at proper height and location relative to adjoining window units and other related work. Securely anchor units with proper clips, brackets, anchorages, suited to type of mounting indicated.
- B. Coordinate the placement of concealed blocking to support blinds.
- C. Verify that openings are ready to receive the work.
- D. Ensure structural blocking and supports are correctly placed.
- E. Provide adequate clearance between sash and blinds to permit unencumbered operation of sash hardware.
- F. Isolate metal parts from concrete and mortar to prevent galvanic action. Use tape or thick coating or other means recommended by manufacturer to effect separation.
- G. Protect installed units to ensure their being in operating condition, without damage, blemishes, or indication of use at completion of project. Repair or replace damaged units as directed by Architect.
- H. Adjust blinds for smooth operation.
- I. Clean blind surfaces just prior to occupancy.
- J. Furnish the following for the Owner's use in maintenance of project:
 - 1. Extra Blind Assemblies: One of each size.
 - 2. Extra Slats: 20 of each type and size.
 - 3. Extra Lift Cords, Control Cords, and Wands: Two of each type.

END OF SECTION

SECTION 12600 – SCOREBOARD

PART 1– GENERAL

1.1 SECTION INCLUDES

- A. Four-sided, center hung LED basketball scoreboard

1.2 REFERENCES

- A. Standard for Electric Signs, UL 48
- B. Standard for CSA C22.2 #207
- C. Federal Communications Commission Regulation Part 15
- D. National Electric Code

1.3 SUBMITTALS

- A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.
- B. Shop drawings: Submit mechanical and electrical drawings.
- C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Product delivered on site
- B. Scoreboard and equipment to be housed in a clean, dry environment

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.
- B. Field Measurements: Provide size, weight and mounting location for coordination. If shot clock is to be mounted to a backstop, mounting hardware shall be supplied by the backstop provider.
- C. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

1.6 QUALITY ASSURANCE

- A. For indoor use only
- B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.
- C. ETL listed to UL 48
- D. NEC compliant
- E. FCC compliant
- F. ETL listed to CSA 22.2 #207

1.7 WARRANTY

- A. Provide 5 years of no cost parts exchange including standard shipping on electronics parts and radios due to manufacturing defects
- B. Provide toll-free service coordination
- C. Provide technical online and phone support during typical business hours

New Gymnasium at Appalachian School
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Oneonta, Alabama

SCOREBOARDS
12600-1

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
 - 1. Daktronics, Inc., 201 Daktronics Drive, P.O. Box 5128, Brookings, SD 57006-5128
- B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.2 PRODUCT

- A. Daktronics BB-2104 four-sided basketball scoreboard displays period time to 99:59, HOME and GUEST scores to 199, PERIOD to nine, team FOULS to 19, PLAYER number to 99, player FOUL to nine and indicates possession and bonus. During the last minute of the period, scoreboard displays time to 1/10 of a second. Scoreboard can also score volleyball, wrestling and any sport requiring a clock, score and period function.

2.3 SCOREBOARD

- A. General information
 - 1. Dimensions: 6'-2" (1.88 m) high, 10'-10" (3.30 m) wide, 10'-10" (3.30 m) deep
 - 2. Base weight: 1020 lb (463 kg) – options may increase weight
 - 3. Base power requirement: 820 W – options may increase wattage
 - 4. Color: provide over 150 colors to choose from
- B. Construction
 - 1. All-aluminum construction
 - 2. Scoreboard back, face, and perimeter: 0.063" (1.60 mm) thick
 - 3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens
- C. Digits & Indicators
 - 1. LED digit technology: **PanaView® (PV) – discrete LEDs protrude through the scoreboard face]**
 - 2. LED color: **Amber clock/colon, PERIOD and PLAYER/FOUL digits and bonus indicators with Red score and FOULS digits and possession indicators**
 - 3. Clock and score digits: 13" (330 mm) high
 - 4. PERIOD, FOULS and PLAYER/FOUL digits: 10" (254 mm) high
 - 5. Bonus indicators: 4" (102 mm) high
 - 6. Possession arrows: 3" (76 mm) high
 - 7. Seven bar segments per digit
- D. Captions
 - 1. Vinyl applied directly to scoreboard face
 - 2. HOME and GUEST captions: 6" (152 mm) high
 - 3. PERIOD, FOULS/SCORE and PLAYER/FOUL/MATCH captions: 4" (102 mm) high

SCOREBOARDS
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4. Color: standard white or others available upon request
- E. Horn
1. Vibrating horn mounted inside the scoreboard cabinet behind the face
 2. Sounds automatically when period clock counts down to zero
 3. Sounds manually as directed by operator
- F. Power Cord
1. Cord is 11' (3.35 m) long
 2. Cord plugs into a standard grounded outlet
- G. Accessory Equipment
1. Vinyl striping applied around the clock and scoreboard face
 2. Two 6" (152 mm) high Programmable Team Name Message Centers (TNMCs) in place of vinyl HOME and GUEST captions – add 60 lb (27 kg) and 240 W
 3. Double bonus indicators in place of single bonus indicators
 4. Two 17" (432 mm) high, 21" (533 mm) wide aluminum panels in upper corners with vinyl logo/sponsor decoration
 5. Two 7" (178 mm) T.O.L. digits and two 3" (76 mm) vinyl captions]
 6. 8' (2.44 m) x 8' (2.44 m) canvas floor in a solid color or logo/sponsor graphics
 7. Four logo/sponsor areas on corner shrouds between scoreboard faces
 8. Different sounding 12 VDC horn in place of buzzer horn

2.4 SCORING CONSOLE

- A. Console is an All Sport® 5000 controller
- B. Scores multiple sports using changeable keyboard inserts
- C. Controls multiple scoreboards, stats displays and shot clocks, including other All Sport 5000 controlled displays currently owned by customer
- D. Recalls clock, score, and period information if power is lost
- E. Runs Time of Day and Segment Timer modes
- F. Console includes:
 1. Rugged aluminum enclosure to house electronics
 2. Sealed membrane water-resistant keyboard
 3. 32-character backlit LCD to verify entries and recall information currently displayed
 4. Power cord that plugs into a standard grounded outlet; 6 watts max
 5. Control cable to connect to the control receptacle junction box (wired system only)
 6. Hand-held switch for main clock start/stop and horn
 7. Soft-sided carrying case

G. Accessory Equipment

1. 2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels; system includes a transmitter installed inside the console and a receiver installed inside the scoreboard(s)
2. Hard carrying case
3. Battery pack

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that mounting surface is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.2 INSTALLATION

- A. Power conduit, cables and outlet boxes to be provided and installed by the electrical contractor. Signal raceways, conduit and boxes to be provided by the electrical contractor. Electrical contractor is also responsible for any required wire and terminators between each scoreboard and control location.
- B. Mount shot clock to wall or to backstop in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.

3.3 INSTALLATION—CONTROL CENTER

- A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.
- B. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative.
- C. Conduct operator training on the scoreboard/controller operation.

END OF SECTION

SECTION 12661 – TELESCOPIC SEATING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Telescopic Gym Seating includes **electrically operated** multiple-tiered seating rows comprising of seat, deck components, understructure that permits closing without requiring dismantling, into a nested configuration for storing or for moving purposes.
1. **[Floor-attached, freestanding telescoping stands]** Banks A, B and C

1.2 REFERENCES

- A. Aluminum Association (AA):
1. ADM 1- Aluminum Design Manual
- B. American Institute of Steel Construction (AISC):
1. AISC 360- Steel Construction Manual.
- C. American Iron & Steel Institute (AISI):
1. AISI S100 – Design of Cold Formed Steel Structural Members.
- D. American Society for Testing Materials (ASTM):
1. ASTM - Standard Specifications for Properties of Materials.
- E. American Wood Council (AWC):
1. ANSI/AWC NDS (National Design Specification for Wood Construction).
- F. American Welding Society (AWS):
1. AWS D1.1 Structural Welding Code – Steel
 2. AWS D1.3 Structural Welding Code - Sheet Steel
- G. Canadian Welding Bureau: CWB Division 3 W47.1
- H. U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.
- I. Forest Stewardship Council:
1. Chain of Custody Certification (FSC-STD-40-004)
- J. International Building Code (IBC): IBC2018
- K. International Code Council (ICC): ICC-300- 2017
1. ICC 300: Standard for Bleachers, Folding and Telescopic Seating and Grandstands.
- L. National Fire Protection Association (NFPA):
1. NFPA 101
 2. NFPA 5000 Building Construction and Safety Code
 3. NFPA 70: National Electrical Code.
- M. National Institute of Standards and Technology (NIST)
1. PS 1: Structural Plywood.
- N. Southern Pine Inspection Bureau (SPIB):
1. SPIB: Standard Grading Rules for Southern Pine.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections. Apply each load to produce maximum stress in each respective component of each telescoping stand unit according to ICC 300 2017.
- B. Manufacturer's System Design Criteria:
1. Gymnasium seat assembly; Design to support and resist, in addition to its own weight, the following forces:
 - a.) Live load of 120 lbs. per linear foot (1.75 kN/m) on seats and decking
 - b.) Uniformly distributed live load of not less than 100 psf (4.79 kN/m²) of gross horizontal projection.
 - c.) Parallel sway load of 24 lbs. per linear foot (0.35 kN/m) of row combined with (b.) above
 - d.) Perpendicular sway load of 10 lbs. per linear foot (0.15 kN/m) of row combined with uniformly distributed live load above.
 - e.) Parallel and Perpendicular sway loads are not applied concurrently.
 2. Hand Railings, Posts and Supports: Engineered to withstand the following forces applied separately:
 - a.) Concentrated load of 200 lbs. (0.89 kN) applied at any point and in any direction.
 - b.) Uniform load of 50 lbs. per foot (0.73 kN/m) applied in any direction.
 3. Guard Railings, Post and Supports: Engineered to withstand the following forces applied separately:
 - a.) Concentrated load of 200 lbs. (0.89 kN) applied at any point and in any direction along top rail.
 - b.) Uniform load of 50 lbs. per foot (0.73 kN/m) applied in any direction at top rail
 - c.) Uniform load of 50 lbs. (0.22 kN) applied on an area equal to 1 ft² (0.09 m²) applied on all guardrail infill panels.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Environmental Data Package: Provide project specific environmental data work sheet with project header and LEED calculations completed based on actual project weight and project price. Environmental Data Package required to be submitted with formal submittal package prior to project award.
1. Regional Manufacturing:
 - a.) Provide manufacturing location and distance to project site by product material type as required. Use straight-line travel as defined by USGBC.
 2. Recycled Content:
 - a.) Provide Packaging Material Listing & Recycled Content by Material Type; total percentage of recycled content, total percentage of pre consumer and post consumer materials.
 - b.) Provide Product Material Listing & Recycled Content by Material Type; total percentage of recycled content, total percentage of pre consumer and post consumer materials.
 3. Indoor Environmental Quality:
 - a.) Provide documentation that the specified product passes ANSI/BIFMA X7.1-2007 Standard for Formaldehyde and TVOC Emissions of Low-emitting Office Furniture Systems and Seating

- b.) Provide documentation that the specified product solid core ply-form or engineered fiber panels are manufactured with resins that are free of added urea-formaldehyde.
 - 4. Product Life Cycle Deconstruction & Reclaiming Opportunity:
 - a.) Provide listing of product materials that can be recycled at the end of the product life cycle and re-enter the recycled or reuse material stream.
- C. Shop Drawings: For telescoping stands in both stacked and extended positions. Show seat heights, row spacing and rise, aisle widths and locations, assembly dimensions, anchorage to supporting structure, material types and finishes.
 - 1. Electrical: Indicate power supply requirements.
 - 2. Graphics Layout Drawings: Indicate pattern of contrasting or matching seat colors.
- D. Samples: For units with factory-applied finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified manufacturer and installer.
- B. Welding certificates.
- C. Product Test Reports: Load test to all loads, observed by a qualified independent testing laboratory, and certified by a registered professional structural engineer verifying the integrity of the manufacturer's design.
- D. Warranty: Manufacturers standard warranty documents.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescopic bleacher to include video operations manual.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: A minimum of 40 years of experience manufacturing telescoping stands and can demonstrate continual design enhancement and 25-year minimum product life-cycle support of telescopic seating.
- B. Installer Qualifications: Factory certification by the manufacturer.
 - 1. Project list: Ten projects of similar size, complexity and in service for at least five years.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Below standard may be more stringent than applicable building code requirements. Coordinate with local building code requirements for telescoping stands.

- E. Seating Layout: Provide telescoping stands to comply with ICC 300 2017 Standard for Bleachers, Folding and Telescopic Seating, and Grandstands, except where additional requirements are indicated or imposed by authorities having jurisdiction.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver telescoping stands in manufacturers packaging clearly labeled with manufacturer name and content.
- B. Handle bleacher equipment in a manner to prevent damage.

- C. Deliver the telescoping stands at a scheduled time for installation that will not interfere with other trades operating in the building when at all possible.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Coordinate actual dimensions of construction affecting telescoping stands installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

1.10 WARRANTY

- A. Manufacturer's Warranty: Includes the repair or replacement of the defective product; or defective component thereof, with a comparable product; or component thereof, or a refund of the purchase price prorated over the warranty period.
 - 1. Includes: Labor, materials, and freight for replacement or repairs.
 - 2. Structural Component parts of Understructure Warranty Period: **[10 years]** from Date of Acceptance
 - 3. Decking systems, seating collections, electrical, portable and integral dolly systems, end closure curtains, surface material finishes Warranty Period **[5 years]** from Date of Acceptance.

PART 2 PRODUCTS

- A. Wood:
 - 1. Lumber: NIST PS 20, southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B&B Finish (B and better) grade-of-finish requirements.
 - 2. Plywood: NIST PS 1, APA-grade trademarked, A-C grade.
- B. Steel:
 - 1. Structural-Steel Shapes, Plates, and Bars: ASTM A36.
 - 2. Galvanized-Steel Sheet: ASTM A653, coating designation G60.
 - 3. Uncoated Steel Strip; Non-Structural Components: ASTM A1011, Commercial Quality, Type B, Hot-Rolled Strip.
 - 4. Uncoated Steel Strip; Structural Components: ASTM A1011 Grade 33 (228 MPa), Grade 36 (249 MPa), Grade 40 (276 MPa), Grade 45 (311 MPa), or Grade 50 (345 MPa), Structural Quality, Hot-Rolled.
 - 5. Galvanized Steel Strip: ASTM A653 Grade 40 (276 MPa), structural quality, coating designation G60.
 - 6. Tubing: ASTM A500, cold formed; Grade B.
- C. Polyethylene Plastic: High-density polyethylene; injection molded, color-pigmented, textured, impact-resistant, and dimensionally stable.

2.2 MANUFACTURERS

- A. Manufacturer: Hussey Seating Company, U.S.A.
 - 1. Address: North Berwick, Maine, 03906.
 - 2. Telephone: (207) 676-2271; Fax: (207) 676-9690.
 - 3. Product: MAXAM Telescopic Gym Seat System.
- B. Equal products of other manufacturers may be used in the work provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid opening.

2.3 TELESCOPING STANDS

TELESCOPIC BLEACHERS SPECIFICATION
12661-4

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- A. **[Floor-Attached, Freestanding Telescoping Stands]:** Forward-folding system with the rear of the understructure permanently attached to the floor only.

2.4 DIMENSIONAL AND OPERATIONAL CRITERIA

- A. Dimensions: Bank A:

1. Bank Length: **<Insert dimension>**.
2. Aisle Width: **<4.5'>**.
3. Number of Tiers: **<Insert number>**.
4. Row Spacing: 26 inches (660 mm).
5. Row Rise: 11-5/8 inches (295 mm).
6. Open Dimension: **<Insert dimension>**.
7. Closed Dimension: **<Insert dimension>**.
8. Overall Unit Height: **<Insert dimension>**.
9. Net Capacity: **<Insert capacity>**.
10. Maximum Net Capacity; with Flex Row Fully Recovered: **<Insert capacity>**.
11. 5'10" closed Dimension
12. Bleacher must be double stacking

- B. Dimensions: Bank B:

1. Bank Length: **<Insert dimension>**.
2. Aisle Width: **<4.5'>**.
3. Number of Tiers: **<Insert number>**.
4. Row Spacing: 26 inches (660 mm).
5. Row Rise: 11-5/8 inches (295 mm)
6. Open Dimension: **<Insert dimension>**.
7. Closed Dimension: **<Insert dimension>**.
8. Overall Unit Height: **<Insert dimension>**.
9. Net Capacity: **<Insert capacity>**.
10. Maximum Net Capacity; with Flex Row Fully Recovered: **<Insert capacity>**.
11. 5'10" closed dimension
12. Bleacher must be double stacking.

- C. Dimensions: Bank C:

1. Bank Length: **<Insert dimension>**.
2. Aisle Width: **<4.5'>**.
3. Number of Tiers: **<Insert number>**.
4. Row Spacing: 26 inches (660 mm).
5. Row Rise: 11-5/8 inches (295 mm).
6. Open Dimension: **<Insert dimension>**.
7. Closed Dimension: **<Insert dimension>**.
8. Overall Unit Height: **<Insert dimension>**.
9. Net Capacity: **<Insert capacity>**.
10. Maximum Net Capacity; with Flex Row Fully Recovered: **<Insert capacity>**.
11. Truncated to tier 6
12. Front panel required/Plywood
13. Front Rail required

2.5

- A. Operation: [Integral Power]
 - 1. Integral Power: Must have Pendant control unit AND Wireless Controller
 - a.) Limit Switches: Automatically stop integral power system when telescoping stands reach fully opened or closed positions.
 - b.) Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB, activates when stands are in motion.

2.6 SEATING

- A. Polymer Seat System: Courtside Collection XC10
 - 1. Material: Gas assist injection-molded, 100 percent recyclable HDPE, high density polyethylene.
 - 2. Module Size: **[18 inches (457 mm)] long by [10 inches (254 mm)] deep.**
 - 3. Module Load: Tested to 600 lbs. (2.67 kN).
 - 4. Seat height range from deck to top of seat: **18-1/8 inches (410 mm).**
 - 5. Integrally molded end caps at aisle end locations.
 - 6. Integrally molded recess pockets to accept seat number and row letters.
 - 7. Integrally molded rear closure panel at back of seat to allow for "continuous clean sweep" of debris at deck level and minimized visibility of structural ribbing.
 - 8. Color: [As selected by Architect from manufacturers 15 standard colors]
- B. ADA Accessible Seating:
 - 1. Locate **[first tier modular units]** to provide wheelchair-accessible seating at locations indicated on Drawings.
 - a.) Flex-Row™: Provide first row modular recoverable seating units that can be closed to accommodate persons requiring ADA spaces (or any other temporary space needs) or opened for standard usage. Each Flex-Row unit shall have a handle for easy operation.
 - b.) Provide a black full-surround steel skirting with no more than ¾" floor clearance for safety and improved aesthetics.
 - 1.) Provide a black injection molded end cap for the nose beam for safety and improved aesthetics.
 - 2.) Provide a mechanical positive lock when the Flex-Row system is in both the open and closed position. Handle shall unlock the modular recoverable seating unit for operation.
 - 3.) Flex-Row can be utilized with the full system in the open or closed position.
 - 4.) Flex-Row modular units are designed to achieve multi-use front row seating to accommodate team seating, ADA requirements and facility specific requirements. Flex-Row units are available in modular units from 2 to 7 seats wide as well as full section widths.

2.7 RAILS, PANELS AND STEPS

- A. End Rails:
 - 1. **[Self-storing]**
 - a.) Provide steel self-storing starting no higher than tier 2 **[42 inches (1066mm)]** high above seat, end rail with tubular supports and intermediate members designed with **[4 inch (102mm)]** sphere passage requirements.
 - 2. Material and Finish: **[Semi-gloss][Gloss]** powder coated steel.
 - 3. Color: **Black**
- B. Center Aisle Rails:

TELESCOPIC BLEACHERS SPECIFICATION

1. **[Auto-Rotating]**
 - a.) Provide single pedestal mount handrails **[34 inches (864mm)]** high with terminating mid rail. Permanently attached handrail shall rotate in a permanently mounted socket for rail storage. Rail shall automatically rotate, lock in the use position, unlock and rotate back to the stowed position as the gym seats open and close. Ends of the handrail shall return to the post, and not extend away from it. Rails having openings to avoid interference with closed decks are not acceptable
 - b.) Manual Rotating Aisle Rails on non moving decks, Bank A and B
2. Material and Finish: **[Semi-gloss][Gloss]** powder coated steel.
3. Color: **[Black][As selected by Architect from manufacturer's 15 colors]**.
- C. Front Rail: Provide not less than **[30 inches (762 mm)]** high above deck, steel rails with tubular supports and intermediate members designed with **[4 inch (102 mm)]** sphere passage requirements. Bank C.
- D. Skirt Panel: On 1st Row, provide galvanized steel front skirt panel to prevent players/objects from sliding underneath the first row.
- E. Steps
 1. **[Sure-Step (Flip-up Front Aisle Step)]**: Permanently hinged to the front row to ensure availability and ease of operation. Two 3" diameter x 3/4" wide non-marking front wheels are provided so that the system can be operated with the Sure-Step in the stored or deployed position. All edges coined, hemmed or radiused with front edge protective rubber bumpers. Abrasive-backed non-slip tread identifier on leading edge of nosing. For aisle widths greater than 6'-0", two side by side hinged steps are provided.
 2. **[Intermediate Aisle Steps]**: Fully enclosed, at each vertical aisle. Full radius end caps on all four edges. Adhesive-backed abrasive non-slip tread surface.

2.8 COMPONENTS

- A. Decking
 1. **[Plywood]**
 - a.) 5/8 inch (16 mm) thick AC grade tongue and groove Southern Yellow Pine with clear urethane, high gloss finish.
- B. Understructure:
 1. Finish: **[Rust-inhibiting black finish][Hot dipped galvanized (High humidity finish)]**.
 2. Hardware finish: **[Zinc-plated, Rust inhibiting black finish] [Corrosion resistant, Hot dipped galvanized (high humidity finish)]**.
 3. Posi-locks and other surfaces: **[Powder coated black, Rust inhibiting black finish] [Electroless-nickel plated, Hot dipped galvanized (High Humidity finish)]**.
 4. Nose beam and Rear Riser beam: Nose beam shall be continuously roll-formed closed tubular shape of ASTM A653 grade 40 (276 MPa). Riser beam shall be continuously roll-formed of ASTM A653 grade 40 (276 MPa). Nose and Riser beam shall be designed with no steel edges exposed to spectator after product assembly. Nose beam and riser beams are through-bolted fore/aft to deck stabilizers and frame cantilevers to create the deck structure.
 5. Frame: The frames are welded assemblies (one left hand, one right hand per tier) comprised of the following components:
 - a.) Lower Track subassembly: ASTM A1011 Grade 50: Continuous Positive Interglide System (casterhorn) interlocks each adjacent frame casterhorn

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- using an integral, continuous, anti-drift feature and captive interlock with adjustable row spacing at front to prevent separation and misalignment.
- b.) Lower Track Wheels: 3 per frame Not less than **[5 inches (127 mm)]** diameter by **[1-1/4 inches (32 mm)]** with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil-impregnated bushings to fit **[3/8 inch (10 mm)]** diameter axles secured with E-type snap rings.
 - 1.) Option: up to 6 wheels per frame for load distribution
- c.) Slant Columns: A500 Grade B, tubular shape.
- d.) Cantilever Subassembly: Consists of ASTM A1011 Grade 50 nose connection plate, cantilever, and riser attachment plate welded together into a subassembly.
- 6. Lock system: Casterhorns at the end sections of powered banks (minimally), and manual sections, contain a Low Profile Posi-Lock LX to lock each row in open position and allow unlocking automatically. Provide adjustable stops to allow field adjustment of row spacings.
- 7. Sway Bracing: ASTM A653 grade 40 (276 MPa), tension members bolted to columns.
- 8. Deck Stabilizer: A1011 Grade 45, member through-bolted to nose and riser at three locations per section. Securely captures front and rear edge of decking at rear edge of nose beam and lower edge of riser beam for entire length of section. Interlocks with adjacent stabilizer on upper tier using low-friction nylon roller to prevent separation and misalignment.
- C. Fasteners: Vibration proof, in manufacturer's standard size and material.

2.9 ELECTRICAL OPERATION SYSTEMS

- A. Integral Power
 - 1. Default operation shall be with a removable pendant control unit which plugs into seating bank for tethered operator management of stop, start, forward, and reverse control of the power operation. Other modes of operation are optional.
- B. PF1/2/3/4: Furnish and install Hussey PF(1/2/3/4), an integral automatic electro mechanical powered frame propulsion system, to open and close telescopic seating.
 - 1. Electrical - Seating Manufacturer shall provide all wiring within seating bank, including pendant control. Motors, housing, and wiring shall be installed and grounded in complete accord with the National Electrical Code. The control system shall operate at low voltage (24V). The electrical contractor shall perform all connections at and upstream of the equipment specified herein and ensure that supplied voltage drops no more than 4% below nominal where power connects thereto.
 - 2. Each unit for PF(1/2/3/4) is driven by a 1/2 horsepower, 1725 RPM motor.
 - a.) 208V 3 Phase:

- 1.) This 1.25 Service Factor motor runs on 208V at 60 Hz and draws a full load current of 1.8 amperes. The required power supply shall be 3 asynchronous phases of 120 Volts each, plus neutral plus ground, each with 20 Amp capacity.
 - 2.) This system shall be UL Listed in its entirety (motors, circuit protection, motor controls, user interface, enclosures, conductors and connectors all evaluated and approved for correct sizing and compatibility under maximum rated load on the motors) under UL Product Category FHJU, titled Electrical Drive and Controls for Folding and Telescopic Seating.
- b.) Each pair of Powered Frames shall consist of output shaft gear reducer with **[6 inch (152mm)]** diameter x **[4 inch (102mm)]** wide wheels covered with non-marring **[1/2 inch (13mm)]** thick composite rubber, and operate the bleacher as follows:
- 1.) PF2 – Pulls at 46 feet / min [16.8 meters / min] with ½ Hp through 60:1 speed reduction to 4 drive wheels. Max pull approx 261 lbs [1161 N];

2.10 FABRICATION

- A. Fabricate understructure from structural-steel members in size, spacing, and form required to support design loads specified in referenced safety standard.
- B. Weld understructure to comply with applicable AWS standards.
- C. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- D. Form exposed sheet metal with flat, flush surfaces, level and true in line, and without cracking and grain separation.

2.11 ACCESSORIES

- A. Permanent Modular Video Platform: [4 feet (1219 mm)] by [10 feet 6 inches] with [Rail sleeves], safety rails. **Media platform must be mounted flush with mezzanine flooring.**

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas where telescoping stands are to be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Tolerances:
 1. Flooring [and rear wall]: Level [and plumb] within **[1/8 inch (3 mm)]** in **[8 feet (2438mm)]**.
 2. Maximum bleacher force on the floor of a **[27 foot (8230 mm)]** section: Static point load of less than 300 psi (2068 kN/m²).
- B. Install telescoping stands to comply with referenced safety standard and manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

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- A. On completion of installation, lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.
- B. Clean installed telescoping stands on exposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

3.4 MAINTENANCE SERVICE

- A. Service Capability: Show proof of full time service capability by factory certified technicians directly employed by the installer.
 - 1. A four to eight-hour maximum on-site repair response is required during normal working hours, 8 a.m. to 5 p.m. weekdays (excluding holidays).
 - 2. All Full Time Service Personnel shall be Factory Authorized and Trained.
 - 3. Provide proof of Service Capability and a list of service parts regularly maintained in inventory.

3.5 DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain telescoping stands.

END OF SECTION

SECTION 13120 - PRE-ENGINEERED BUILDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications sections apply to work specified in this Section.

1.2 SUMMARY

- A. Extent of pre-engineered buildings work is shown on drawings.
- B. Building Type: The pre-engineered building system shown is a single story, rigid frame type metal building of the nominal length, width, eave height and roof pitch indicated.
 - 1. Manufacturer's standard components may be used, providing components, accessories, and complete structure conform to architectural design appearance shown and to specified requirements.
 - 2. Concrete floor and foundations and installation of anchor bolts are specified in a Division 3 section. Provide anchor bolts (including sizes and lengths) and anchor bolt plan to Contractor for work by others.
 - 3. Sealants and caulking are specified in Division 7 section.
 - 4. Provide blanket insulation under roof and inside walls as indicated on drawings and specified in Section 07200, Insulation.
 - 5. Provide prefinished metal roof panels as indicated on drawings and specified in Section 07410, Preformed Metal Roofing.
 - 6. Provide interior and exterior wall panels as indicated on drawings and specified in Section 07421, Metal Wall Panel and Section 09800, Acoustical Metal Wall Panel System
 - 7. Provide prefinished fascia, vented/non-vented soffit systems, flashing, drip edge, trim, gutters and downspouts as indicated on drawings and specified in Section 07600, Flashing and Sheet Metal.

1.3 DESCRIPTION

- A. Provide all materials, labor, equipment and services, and perform all operations in connection with the furnishing and installing of pre-engineered building, in accordance with the drawings and specifications, including the following:
 - 1. Metal Framing Components
 - 2. Metal Building Accessories
 - 3. Workmanship
 - 4. Inspection of Surfaces
 - 5. Protection
 - 6. Delivery, Samples and Shop Drawings
 - 7. Guarantee and Warranty

1.4 SUBMITTALS

- A. **Any deviation (deletions, additions or revisions thereof) 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 in 'RED' and, in a letter transmitting the Submittal to the Architect, the Supplier and Contractor shall direct the Architect's attention to, and request specific approval of, the specific deviations. Otherwise, the Architect's approval of a Submittal does not constitute approval of any deviation from the requirements of the Contract Documents contained in the Submittal.**

Should any deviation be found at a later date, the Supplier and Contractor shall bear the responsibility and cost of all corrections required.

- B. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories. Submit sample warranty.
- C. Shop Drawings: Submit complete erection drawings showing anchor bolts settings, sidewall, endwall, and roof framing, transverse cross sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.
 - 1. **The shop drawings MUST be submitted as an "overlay" drawing to the Architectural drawings.**
 - 2. **The Contractor/supplier MUST provide the "overlay" drawings including the Architectural drawings in the complete submittal.**
 - 3. **The "overlay" drawings must be submitted in 'RED' with the Architectural drawings in 'BLACK'.**
- D. Samples: The contractor shall submit roofing samples of finished roofing system for pre-engineered buildings per Section 07410, Preformed Metal Roofing.
- E. Certification: Submit written Certification and all structural calculations prepared and signed by a Professional Engineer, registered to practice in the State where building is to be erected, verifying that building design meets indicated loading requirements and codes of authorities having jurisdiction. Calculations shall clearly show all loads used for the design of each member. All column reactions at the foundation shall be provided for verification of the foundation design.

1.5 QUALITY ASSURANCE

- A. Design Criteria:
 - 1. **All items below shall be designed within the architectural design furring spaces. Refer to submittal requirements above for deviations made from the requirements of the Contract Documents.**
 - 2. Structural Framing: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual".
 - 3. Structural Steel: For design of structural steel members, comply with requirements of the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
 - 4. Light Gage Steel: For design of light gage steel members, comply with requirements of the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
 - 5. Welded Connections: Comply with requirements of the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.
 - 6. Impact Resistance: Roof coverings installed on low-slope roofs (roof slope <2:12) shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test" FM 4470.
- B. Design Loads: Building shall meet all applicable Codes.
 - 1. Basic design loads include live load, wind load and up-lift, in addition to the dead load. Minimum acceptable design loads and deflection criteria are shown on the drawings.
 - 2. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual".
- C. Manufacturer's Qualifications: Provide pre-engineered metal buildings as produced by a manufacturer with not less than 5 years successful experience in the fabrication of

pre-engineered metal buildings of the type and quality required. Manufacturer will be a member of the MBMA.

- D. Erector's Qualifications: Pre-engineered building shall be erected by a firm that has not less than 5 years successful experience in the erection of pre-engineered buildings similar to those required for this project, and that has been licensed by the manufacturer of the building system.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store prefabricated components, sheets, panels and other manufactured items so they will not be damaged or deformed.
- B. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials which might cause staining.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The following manufacturers' products have been used to establish minimum standards for materials, workmanship and function:
1. ACI Building Systems
 2. American Buildings Company
 3. Bigbee Steel Buildings, Inc.
 4. Butler Buildings Company
 5. Ceco Building Systems
 6. Mesco Buildings
 7. Morin Building Systems
 8. NCI Building Systems
 9. Nucor Building Systems
 10. Varco-Pruden Building System

2.2 MATERIALS

- A. Hot-Rolled Structural Shapes: Comply with requirements of ASTM A36 or A529.
- B. Tubing or Pipe: Comply with requirements of ASTM A500, Grade B, ASTM A501, or A53.
- C. Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with requirements of ASTM A529, A570 or A572.
- D. Members Fabricated by Cold Forming: Comply with requirements of ASTM A607, Grade 50.
- E. Bolts for Structural Framing: Comply with requirements of ASTM A307 or A325 as necessary for design loads and connection details.

2.3 PRIMARY FRAMING

- A. Rigid Frames shall be fabricated from hot-rolled structural steel. Provide built-up "I-beam" shape rigid frames consisting of either tapered or parallel flange beams and straight columns. Provide frames factory welded and shop painted. Furnish frames complete with attachment plates, bearing plates and splice members. Factory drill frames for bolted field assembly.
1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standard, and if approved by the Architect.
 2. Provide rigid frames at endwalls where indicated.
- B. End Wall Columns: Provide factory welded, shop painted endwall columns built-up "I" shape

welded plate.

- C. Wind Bracing: Provide horizontal and adjustable wind bracing at roof only using diagonal cables or threaded steel rods; comply with requirements of ASTM A36 or A572, Grade D.

2.4 SECONDARY FRAMING

- A. The spacing of all purlins as shown on the drawings is diagrammatic, therefore, the Registered Professional Engineer for the Pre-Engineered Building shall be responsible for the design of the roof structure to support the framing to meet all state, federal and local code restrictions and structural requirements set forth by the structural engineer. It shall be the responsibility of the Pre-Engineered Building manufacture to coordinate with the Bidding Contractor the amount of erection required for the roof framing before bidding.
- B. Provide not less than 16-ga. shop painted rolled formed sections for the following secondary framing members unless shown otherwise on structural contract drawings.
 - 1. Purlins.
 - 2. Eave struts.
 - 3. Endwall rafters.
 - 4. Flange bracing.
 - 5. Sag bracing.
- C. Provide not less than 14-ga. cold-formed galvanized steel sections for the following secondary framing members:
 - 1. Base channels.
 - 2. Sill angles.
 - 3. Endwall structural members (except columns and beams).
 - 4. Purlin spacers.
- D. Bolts: Provide ASTM A307 bolts, at secondary structural connections. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels. Primary structural connections to be made with ASTM A325 bolts.
- E. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SPI for solvent cleaning.
 - 1. Prime structural steel primary and secondary framing members. See Structural Steel 05500 page 3 - Structural Steel Prime Paint and page 5 - Shop Painting.
 - 2. Prime galvanized members, after phosphoric acid pretreatment with manufacturer's standard zinc dust-zinc oxide primer.

2.5 ROOFING, WALL PANELS, SHEET METAL ACCESSORIES & MISC. MATERIALS

- A. See Section 07410 – Preformed Metal Roofing
 - 1. Manufacturer's Warranty
 - a. **Manufacturer's roofing warranties which contain language regarding the governing of the warranty 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 warranties.**
- B. See Section 07421 – Metal Wall Panels

2.6 FACIA, SOFFIT, FLASHING, DRIP EDGE, TRIM, GUTTERS AND DOWNSPOUTS

- A. See Section 07600 – Flashing and Sheet Metal

2.7 FABRICATION

- A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged and reassembled with a minimum amount of labor.
 - 1. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams and instruction manuals.
- B. Structural Framing: Shop fabricate structural framing components to the indicated size and section complete with base plates, bearing plates and other plates required for erection, welded in place. Provide required holes for anchoring or connections either shop drilled or punched to template dimensions.
 - 1. Shop Connections: Provide power riveted, bolted or welded shop connections.
 - 2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.1 ERECTION

- A. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.
- B. Purlins and Girts: Provide rake or gable purlins with tight fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.
- C. Bracing: Provide Temporary Cross Bracing as required for full height of bays. Temporary cross bracing shall be removed upon completion of final cross bracing.
- D. Final Cross Bracing shall be as shown and described on the Structural Drawings. The Contractor shall furnish and install cross bracing as directed by the Structural Engineer – no exceptions. Portal frames are not permitted.
- E. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

3.2 ROOFING, WALL PANELS, SHEET METAL ACCESSORIES & MISC. MATERIALS

- A. See Section 07410 – Preformed Metal Roofing
 - 1. 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, 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. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.
 - 2. The pre-roofing conference is intended to clarify demolition and application requirements for work to be completed before roofing operations can begin. 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.

3. The following are to be accomplished during the conference:
 - a. To review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
 - b. To establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
 - c. To establish roofing schedule and work methods that will prevent roof damage.
 - d. Require that all roof penetrations and walls be in place prior to installing the roof.
 - e. To establish those areas on the job site that will be designated as work and storage areas for roofing operations.
 - f. To establish weather and working temperature conditions to which all parties must agree.
 - g. To 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.
 4. 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 Division of Construction Management, and the Division of Construction Management Inspector.
- B. See Section 07421 – Metal Wall Panels.

3.3 FACIA, SOFFIT, FLASHING, DRIP EDGE, TRIM, GUTTERS AND DOWNSPOUTS

- A. See Section 07600 – Flashing and Sheet Metal

END OF SECTION

SECTION 13670 - ALUMINUM WALKWAY COVER (Roll Formed)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 SCOPE OF WORK

- A. The work covered by this section shall include furnishings and installing Aluminum Canopy, decking, fascia downspouts and concrete footings. The canopy shall consist of structural aluminum panels bound by a framework of fascia which also acts as a water collecting gutter. All components shall be as required to support design loads in accordance with engineering prints and calculations provided by the manufacturer, sizes shown on the drawings are for diagrammatical purposes only.

1.3 REFERENCES

- A. Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.
- B. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- C. American Architectural Manufacturers Association (AAMA)
- D. American Society for Testing and Materials (ASTM)

1.4 RELATED SECTIONS

- A. Concrete Work - Section 03300
- B. Miscellaneous Metals - Section 05500
- C. Flashing and Sheet Metal - Section 07600
- D. Sealants - Section 07900

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's product information, specifications and installation instructions for components and accessories.
- B. Shop Drawings: Submit complete erection drawings showing attachment system, column and gutter beam framing, transverse cross sections, covering and trim details, and option installation details to clearly indicate proper assembly of components. Detailed shop drawings shall be submitted: Submit written Certification prepared and signed by a State Registered Structural Engineer verifying that framing design will safely resist wind uplift as computed by ANSI A58.1, IV=150, Exposure C, as well as meet indicated loading requirements of the Standard Building Code, latest edition as referenced in State Requirements for Educational Facilities 1999 and wind loading requirements of ANSI/ASCE 7-98, live and dead loads and other load requirements.

1.6 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following except as otherwise indicated: Standard building code, latest addition with amendments, if any. AWS (American Welding Society) standards for structural aluminum welding.
- B. Manufacturer: Obtain aluminum covered walkway system from only one (1) manufacturer, although several may be indicated as offering products complying with requirements.
- C. Installer Qualifications: Firm with not less than three (3) years' experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.
- D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work.

- E. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system (sidewalk, curbs, building fascia, etc.).

1.7 WARRANTY

- A. Provide manufactures standard one-year warranty that shall include, but not limited to, coverage for structural, water tightness and finish beginning the day of Substantial Completion of Installation.

PART 2 - PRODUCT

2.1 MANUFACTURERS

- A. The following manufacturers products have been used to establish minimum requirements for materials, workmanship, and function:
 - 1. Extruded Aluminum Walkway Cover System.
 - a. Tennessee Valley Metals, Inc. **(Basis of Design and Standard of Quality)** | 190 Industrial Park Road, Oneonta, Alabama 35121 | (205) 274-9500 | www.tvmetals.com.
 - b. Dittmer Architectural Aluminum | 1006 Shepherd Road | Winter Springs, Florida 32708 | (800) 822-1755; (407) 699-1755 | www.dittdeck.com | info@dittdeck.com.
 - c. Superior Mason Products LLC. | 116 Citation Court, Birmingham, Alabama 35209 | (877) 445-1200 | www.superiormetalproducts.com | canopysales@superior-mason.com.
 - d. Mitchell Metals | 1761 McCoba Dr. SE Suite B, Smyrna, Georgia 30080 | (770) 285-5875; | www.mitchellmetals.net | sales@mitchellmetals.net.
 - e. Gulf South Metals | 17869 Samantha Drive, Foley, Alabama 36535 | (251) 943-6443; | www.gulfsouthmetals.com | info@gulfsouthmetals.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved, by the Architect, not less than ten (10) days prior to scheduled bid opening.

2.2 MATERIALS

- A. Aluminum Extrusions: All sections shall be extruded or roll formed aluminum 6063 alloy, heat treated to T-6 temper.

2.3 FINISHES

- A. Standard:
 - 1. Factory baked enamel finish, AAMA 603.8.
 - a. Color to be selected by Architect after bid date from manufactures standards.
 - b. Standard Color Selection must include "White".

2.4 COMPONENTS

- A. Columns: Columns shall be radius-cornered tubular extrusion of size shown on drawings with cutout and internal diverter for drainage where indicated. Circular downspout opening in column is not acceptable.
- B. Beams: Beams shall be extrusions of size and shape shown on drawings, top edges thickened for strength and designed to receive deck members in self-flashing manner. Structural ties shall be installed in tops of all beams.
- C. Deck: Deck shall be .032 roll formed W-pan self-flashing sections interlocking into a composite unit.
- D. Fascia: Fascia shall be manufacturer's standard shape (6" minimum.).
- E. Flashing: Flashing shall be .032 aluminum (min.). All thru-wall flashing is completed by others.

2.5 FABRICATION

- A. Drainage: Water shall drain directly from the fascia and be diverted by a scupper plate.
- B. Deck Construction: Deck shall be manufactured of roll formed modules that interlock in a self-flashing manner. Interlocking joints shall be positively fastened at 18" O.C. creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Deck shall be assembled with sufficient camber to offset dead load deflection.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Erection shall be performed after all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.2 INSTALLATION

- A. Column Sleeves: Column sleeves (styro-foam block-outs) or anchor bolts (if required) shall be furnished by the manufacture and installed by the General Contractor.
- B. Erection: Protective cover shall be erected true to line, level and plumb.

3.3 CLEANING

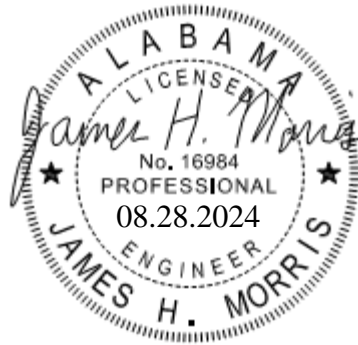
- A. All protective cover components shall be cleaned promptly after installation.

3.4 PROTECTION

- A. Extreme care shall be taken to protect materials during and after installation.

END OF SECTION

DIVISION 13 SPECIFICATIONS



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SECTION 13921 ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS AND JOCKEY PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions

1.2 SUMMARY and Division 01 Specification Sections, apply to this Section.

- A. Section Includes:
 - 1. Vertical in-line fire pumps.
 - 2. Fire-pump accessories and specialties.
 - 3. Jockey pump and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Pump Equipment, Accessory, and Specialty Pressure Rating: 250 psig (1200 kPa) minimum unless higher pressure rating is indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each fire pump and jockey pump, from manufacturer.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire pumps and jockey pumps, to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the latest edition of NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. NFPA Compliance: Comply with the latest edition of NFPA 20, "Installation of Stationary Pumps for Fire Protection."

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

- A. Description: Factory-assembled and -tested fire-pump and driver unit.
- B. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

2.2 VERTICAL IN-LINE FIRE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Patterson Pump Company
 - 2. Peerless Pump, Inc.
 - 3. Aurora Pump.
 - 4. Armstrong.
- B. Fire Pump:
 - 1. The fire pump shall be a vertical in-line, cast iron, bronze fitted, centrifugal fire pump listed by Underwriters Laboratories and/or approved by Factory Mutual (UL/FM). The unit shall meet all the requirements of the National Fire Protection Association's Pamphlet No. 20 (NFPA 20 – latest edition) and shall be hydrostatically tested to a minimum of 250 PSI, or not less than 1.5 times the maximum shut-off pressure.
 - 2. The fire pump shall be designed to deliver 400 GPM at a total head of 50 PSI. The pump shall operate at no greater than approximately 3525 RPM and deliver no less than 65% of rated head at 150% or rated capacity. The shutoff pressure shall not exceed 175 PSI.
 - 3. The fire pump shall be a Model 5x3 VIP (vertical inline pump) as manufactured by Patterson Pumps or approved equal.
 - 4. Standard: UL 448, for vertical in-line pumps for fire service.
 - 5. Casing: Radially split case, cast iron with ASME B16.1 pipe-flange connections.
 - 6. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
 - 7. Wear Rings: Replaceable bronze.
 - 8. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 - 9. Mounting: Pump and driver shaft is vertical, with motor above pump and pump on base.
- C. Fire Pump Motor: The fire pump motor shall be listed for fire protection service by Underwriters Laboratories. The fire pump motor shall be an induction motor rated for 20 HP at 460 VAC, 3 phase, 60 hertz, turning at a nominal speed of 3525 RPM with a 1.15 service factor. Motor enclosure shall be ODP – open drip-proof.

2.3 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing (250 psig rated).
- B. Circulation Relief Valves: UL 1478, brass, spring loaded; for installation in pump discharge piping (250 psig rated).
- C. Relief Valves:
 - 1. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping (250 psig rated).
- D. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.
- E. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.
- F. Fire Pump Accessories:
 - 1. Suction pressure gauge.
 - 2. Discharge pressure gauge.
 - 3. 3/4" casing relief valve.
 - 4. 1/2" air release valve.

The following accessories will be provided according to NFPA 20 pipe size guidelines, if required:

An eccentric increaser on the pump suction if the inlet pipe size is larger than the pump inlet.

- 5. 4" test header, complete with 250 PSI rated header flange.
- G. Jockey Pump: The Jockey Pump shall be a centrifugal close-coupled vertical type, mechanical sealed, cast-iron suction and discharge chambers, with stainless steel impeller(s), shaft and wet parts. Designed for 5 GPM, 68 PSI, 3450 RPM, complete with vertical open-drip proof motor rated for .75 HP, 3 Phase, 60 Cycle, 460 Volt operation.

2.4 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink and recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect fire pumps according to UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1. Verification of Performance: Rate fire pumps according to UL 448.
- B. Fire pumps will be considered defective if they do not pass tests and inspections.

- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fire-Pump Installation Standard: Comply with the latest edition of NFPA 20 for installation of fire pumps, relief valves, and related components.
- B. Equipment Mounting: Install fire pumps on concrete bases. Comply with requirements for concrete bases specified in Section 03300 "Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 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 fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.
- D. Support piping and pumps separately so weight of piping does not rest on pumps.
- E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in "Wet-Pipe Fire-Suppression Sprinklers Systems" section.
- F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in "Wet-Pipe Fire-Suppression Sprinklers Systems" section.
- G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to the latest edition of NFPA 20.
- H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.
- I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.3 ALIGNMENT

- A. Align pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

- A. Comply with requirements for piping and valves specified in "Wet-Pipe Fire-Suppression Sprinklers Systems" section. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect relief-valve discharge to drainage piping or point of discharge.
- D. Connect sensors and valves to tubing.
- E. Connect fire pumps to their controllers.

3.5 IDENTIFICATION

- A. Identify system components. Comply with requirements for fire-pump marking according to the latest edition of NFPA 20.

3.6 FIELD QUALITY CONTROL

- A. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers specified in Section 13929 "Controllers for Fire-Pump Drivers."
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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.
- D. Tests and Inspections:
 - 1. After installing components, assemblies, and equipment including controller, test for compliance with requirements.
 - 2. Test according to the latest edition of NFPA 20 for acceptance and performance testing.
 - 3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

- F. Prepare test and inspection reports.
- G. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.7 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire pumps.

END OF SECTION

SECTION 13929 CONTROLLERS FOR FIRE PUMP AND JOCKEY PUMP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Full-service, reduced-voltage controllers rated 600 V and less.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each type of product indicated. Include dimensioned plans, elevations, sections, details, and attachments to other work, including required clearances and service spaces around controller enclosures.
 - 1. Show tabulations of the following:
 - a. Each installed unit's type and details.
 - b. Enclosure types and details for types other than NEMA 250, Type 2.
 - c. Factory-installed devices.
 - d. Nameplate legends.
 - e. Short-circuit current (withstand) rating of integrated unit.
 - f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
 - 2. Detail equipment assemblies and indicate dimensions, weights, loads, method of field assembly, components, and location and size of each field connection.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of product indicated, from manufacturer.
- B. Manufacturer's factory test reports of fully assembled and tested equipment.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of product indicated to include in emergency, operation, and maintenance manuals.
 - 1. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor-based logic controls.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Indicating Lights: Two of each type and color of lens installed; two of each type and size of lamp installed.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire-pump controllers and all associated equipment from single source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the latest edition of NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with standards of authorities having jurisdiction pertaining to materials and installation.
- D. Comply with the latest editions of NFPA 20 and NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Ambient Temperature Rating: Not less than 40 deg F (5 deg C) and not exceeding 122 deg F (50 deg C) unless otherwise indicated.

1.10 COORDINATION

- A. Coordinate layout and installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 FIRE PUMP CONTROLLER

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cutler-Hammer
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. Master Control Systems, Inc.
 - 4. Firetrol
- B. General Requirements:

1. Controller: The main fire pump controller shall be a factory assembled, wired, and tested unit and shall conform to all the requirements of the latest edition of NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection and the latest edition of NFPA 70, National Electrical Code. Firetrol "Model FTT1930-AM20B" or approved equal.

The controller shall be listed by Underwriters Laboratories, Inc., in accordance with UL218, Standard for Fire Pump Controllers, CSA, and Canadian Standards Association CSA-C22.2, Standard for Industrial Control Equipment (cULus), approved by Factory Mutual and for fire pump service.

- a. Starting Method: The controller shall be of the combined manual and automatic type designed for:

- Soft start; floor mount

The fire pump motor shall have the horsepower, phase and frequency rating shown on the plans and drawings. The controller components shall be housed in a NEMA Type R (IEC IP11) drip-proof, wall mounted enclosure.

- b. Withstand Ratings (Short Circuit Current Ratings): All controller components shall be front mounted, wired, and front accessible for maintenance. The minimum withstand rating of the controllers shall not be less than 100,000 Amps RMS Symmetrical at 200-600 Volts*. If the available system fault current exceeds these ratings, the controllers shall be supplied with a withstand rating of 150,000- or 200,000-Amps RMS Symmetrical, as required.

** Note: 100,000 Amp withstand rating not available in some larger horsepower. Consult factory for details.*

- c. Isolation Switch and Circuit Breaker: The controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked, and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch ON first, and then the circuit breaker. When the handle is moved from ON to OFF, the interlocking mechanism shall sequence the circuit breaker OFF first, and then the isolating disconnect switch.

The isolating disconnect switch/circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism. The isolating disconnect switch/circuit breaker shall be capable of being padlocked in the OFF position for installation and maintenance safety and shall also be capable of being locked in the ON position without affecting the tripping characteristics of the circuit breaker. The controller door shall have a locking type handle and three-point cam and roller vault type hardware. The circuit breaker trip curve adjustment shall be factory set, tested, and sealed for the full load amps of the connected motor. The circuit breaker shall be capable of being field tested to verify actual pick up, locked rotor, and instantaneous trip points after field installation without disturbing incoming line and load conductors.

- d. Operator Interface: The fire pump controller shall feature an operator interface with user keypad. The interface shall monitor and display motor operating conditions, including all alarms, events, and pressure conditions. All alarms, events, and pressure conditions shall be displayed with a time and date stamp. The display shall be a two-line, 20-character, vacuum fluorescent, dot matrix type designed to allow easy viewing from all angles and in all light conditions. The display and interface shall be NEMA rated for Type 2, 3R, 4, 4X, and 12

protection and shall be fully accessible without opening the controller door. The display and user interface shall utilize multiple levels of password protection for system security. A minimum of three (3) password levels shall be provided. The display shall be capable of being programmed for any language.

- e. Ammeter/Voltmeter: The fire pump controller operator interface shall be capable of displaying true RMS digital motor voltage and current measurements for all three phases simultaneously. Displays requiring push-button and selector switches to toggle between phases or current and voltage shall not be accepted.

Voltage and current shall be measured by True RMS technology to provide the most accurate measurement for all sine waves, including non-sinusoidal waveforms. Average responding meters will not be accepted.

- f. Digital Status/Alarm Messages: The digital display shall indicate text messages for the status and alarm conditions of:

- Motor On
- Minimum Run Time / Off Delay Time
- Fail to Start
- Under Voltage
- Low Suction Pressure
- Emergency Start
- Drive Not Installed
- Disk Error
- Disk Near Full
- Sequential Start Time
- Local Start
- Remote Start
- System Battery Low
- Over Voltage
- Over Frequency
- Motor Over 320%
- Motor Overload
- Printer Error
- Pressure Error

The Sequential Start Timer and Minimum Run Timer/ Off Delay Timer shall be displayed as numeric values reflecting the value of the remaining time.

- g. LED Visual Indicators: LED indicators, visible with the door closed, shall indicate:

- Power On
- Pump Running
- Alarm
- Deluge Open
- Phase Failure
- Interlock On
- Emerg. Isolating Switch Open
- Low System Pressure
- Transfer Switch Normal
- Transfer Switch Emergency
- Phase Reversal

h. Data Logging: The digital display shall monitor the system and log the following data:

- Motor Calls/Starts
- Last Trip Currents
- Last Breaker Trip
- Minimum Voltages
- Maximum Voltages
- Last Phase Failure
- Last Phase Reversal
- Min/Max Pressure
- Elapsed Motor Run Time
- Elapsed Power on Time
- Minimum Run Currents
- Maximum Run Currents
- Last Motor Run Time
- Last Start Currents
- Min/Max Frequency

i. Event Recording:

Memory – The controller shall record all operational and alarm events to system memory. All vents shall be time and date stamped and includes and index number. The system memory shall have the capability of storing 3000 events and allow the user access to the event log via the user interface. The user shall have the ability to scroll through the store messages in groups of 1, 10 or 100.

USB Host Controller – The controller shall have a built-in USB Host Controller. A USB port capable of accepting a USB Flash Memory Dish (aka: flask drive, thumb drive, memory stick, etc..) shall be provided. The controller shall save all operational and alarm events to the flash memory on a daily basis. Each saved event shall be time and date stamped. The total amount of historical data saved stamped. The total amount of historical data saved shall solely depend on the size of the flask disk utilized. The controller shall have the capability to save settings and values to the flash disk via the user interface.

Serial Communications – The controller shall feature an RS485 serial communications port for use with 2 or 4 wire Modbus RTU communications.

j. Solid State Pressure Transducer: The controller shall be supplied with a solid state pressure transducer with a range of 0-300 psi (0-20.7 bar) ±1 psi. The solid state pressure switch shall be used for both display of the system pressure and control of the fire pump controller. Systems using analog pressure devices or mercury switches for operational control will not be accepted.

The START, STOP and SYSTEM PRESSURE shall be digitally displayed and adjustable through the user interface. The pressure transducer shall be mounted inside the controller to prevent accidental damage. The pressure transducer shall be directly pipe mounted to a bulkhead pipe coupling without any other supporting members. Field connections shall be made externally at the controller coupling to pre-vent distortion of the pressure switch element and mechanism.

k. Operation:

A digitally set On Delay (Sequential Start) timer shall be provided as standard. Upon a call to start, the user interface shall display a message indicating the remaining time value of the On Delay timer.

The controller shall be field programmable for manual stop automatic stop. If set for automatic stopping, the controller shall allow the user to select either a Minimum Run Timer or an Off Delay Timer. Both timers shall be programmable through the user interface.

The controller shall include an AC Power Loss start timer to start the engine in the event of AC Power failure.

The controller shall be fully programmable to allow up to 8 custom alarm messages to be displayed on the user interface.

A weekly test timer shall be provided as standard. The controller shall have the ability to program the time, date, and frequency of the weekly test. In addition, the controller shall have the capability to display a preventative maintenance message for a service inspection. The message text and frequency of occurrence shall be programmable through the user interface.

A Lamp Test feature shall be included. The user interface shall also have the ability to display the status of the system inputs and outputs.

- I. Battery Chargers: The controller shall include two fully automatic, 200-amp hour, 4 step battery chargers. The chargers shall feature a qualification stage, in which the batteries are examined by the charger to insure that they are not defective and are capable of accepting a charge. The battery charger shall feature:

- Selectable AC Power Voltage
- Selectable Battery Voltage
- Selectable Battery Type
- Charge Cycle Reset Push-button

2.2 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect fire-pump controllers according to requirements in the latest edition of NFPA 20.
 1. Verification of Performance: Rate controllers according to operation of functions and features specified.
- B. Fire-pump controllers will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

2.3 JOCKEY PUMP CONTROLLER

- A. The jockey pump controller shall be equal to Webtrol "Model NV6B6FE3T", complete with fusible disconnect, "HAND-OFF-AUTOMATIC" selector switch and a pressure switch. The controller shall be rated for .75 HP, 3 phase, 60 cycle, 460-volt operation.

The minimum enclosure rating shall be NEMA 3R, drip tight.

The following options shall be included:

Casing relief valve.
Running period timer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive equipment, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROLLER INSTALLATION

- A. Install controllers within sight of their respective drivers.
- B. Connect controllers to their dedicated pressure-sensing lines.
- C. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than 79 inches (2006 mm) above finished floor, and bottom of enclosure not less than 12 inches (305 mm) above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall.

3.3 POWER WIRING INSTALLATION

- A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in the latest editions of NFPA 20 and NFPA 70, and as specified in "Conductors and Cables" section.
- B. Comply with NECA 1.

3.4 CONTROL AND ALARM WIRING INSTALLATION

- A. Bundle, train, and support wiring in enclosures.
- B. Connect automatic activation devices where applicable.

3.5 IDENTIFICATION

- A. Comply with requirements in the latest edition of NFPA 20 for marking fire-pump controllers.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in the latest edition of NFPA 20 and as specified in "Electrical Identification" section.

3.6 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. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

- a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
- b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
- c. Test continuity of each circuit.

2. Verify and Test Each Electric-Driver Controller:

- a. Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for any motor, notify Architect before starting the motor(s).
- b. Test each motor for proper phase rotation.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Field Acceptance Tests:

1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Architect and authorities having jurisdiction.

2. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.

3. Engage manufacturer's factory-authorized service representative to be present during the testing.

4. Perform field acceptance tests as outlined in the latest edition of NFPA 20.

D. Controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Adjust controllers to function smoothly and as recommended by manufacturer.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

D. Set field-adjustable pressure switches.

3.9 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.
- B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain controllers, and to use and reprogram microprocessor-based controls within this equipment.

END OF SECTION

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SECTION 13930 WET-PIPE FIRE-SUPPRESSION SPRINKLERS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Pipes, fittings, and specialties.
 2. Fire-protection valves.
 3. Fire-department connection
 4. Sprinklers.
 5. Alarm devices.
 6. Pressure gages.
 7. Backflow preventer

1.2 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

1.3 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping which contains water and is connected to water supply through a wet system control riser. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included as indicated on the fire sprinkler design drawings.

1.4 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Components: Listed for 175-psig (1200-kPa) minimum working pressure.
- B. Design: Design sprinkler system(s), including comprehensive analysis, using performance requirements and design criteria indicated.
- C. Sprinkler system design shall be approved by authorities having jurisdiction.
1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers, unless noted otherwise in design drawings.
 2. Sprinkler Occupancy Hazard Classifications: Comply with NFPA 13 (2019)
 3. Minimum Density for Automatic-Sprinkler Piping Design: Comply with NFPA 13 (2019). Exceptions may be applied as allowed by NFPA 13 (2019).
 4. Maximum Protection Area per Sprinkler: Per UL listing and per NFPA 13 (2019).
 5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 (2019) unless otherwise indicated:
 - a. Light-Hazard Occupancies: 100 gpm (6.3 L/s) for 30 minutes.

- b. Ordinary-Hazard Occupancies: 250 gpm (15.75 L/s) for 60 to 90 minutes.

1.5 SUBMITTALS

- A. Product Data: Fire sprinkler contractor shall submit factory generated data for each type of product proposed to be used. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Choice of options shall be clearly indicated.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, wiring diagrams, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Coordination Drawings: (ACAD 2010 Edition or Higher) Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. HVAC ductwork and piping.
 - 3. Items penetrating finished ceiling including, but not limited to, the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Alarm Components
- D. Qualification Data: For qualified Installer.
- E. Approved Sprinkler Piping Drawings: (ACAD 2010 Edition or higher) Working plans, prepared according to NFPA 13 (2019) Chapter 23, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- F. Welding certificates.
- G. Fire-hydrant flow test report.
- H. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 (2019). Include "Contractor's Material and Test Certificate for Aboveground Piping."
- I. Field quality-control reports shall be regularly generated and delivered to the General Contractor, Architect, and Owner's representative.
- J. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems. Base system designs on results of fire-hydrant flow test conducted no more than twelve months prior to submitting calculations.

- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13 (2019) "Installation of Sprinkler Systems."
 - 2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the latest edition of NFPA 70 and marked for intended location and application.
 - 3. International Fire Code (2021 Edition)
 - 4. International Building Code (2021 Edition)

1.7 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings including, but limited to, light fixtures, electrical equipment, HVAC equipment, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Section, in this specification, for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Schedule 40 Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 (DN 125) and smaller.
- C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- D. Uncoated, Steel Couplings: ASTM A 865, threaded.
- E. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable- or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME 16.1, Class 125.

- H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. National Fittings, Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - 2. Pressure Rating: 250 psig (1725 kPa) minimum.
 - 3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 - 1. Valves shall be UL listed or FM approved.
 - 2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig (1200 kPa).
- B. Ball Valves:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Anvil International, Inc.
 - b. Victaulic Company.
 - c. Nibco Inc.
 - d. Milwaukee Valve Company
 - 2. Standard: UL 1091 except with ball instead of disc.
 - 3. Valves NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
 - 4. Valves NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 5. Valves NPS 3 (DN 80): Ductile-iron body with grooved ends.
- C. Bronze Butterfly Valves:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Fivalco Inc.
 - b. Global Safety Products, Inc.
 - c. Milwaukee Valve Company.
 - 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig (1200 kPa).
 - 4. Body Material: Bronze.
 - 5. End Connections: Threaded.

D. Iron Butterfly Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Global Safety Products, Inc.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Tyco Fire & Building Products LP.
 - e. Victaulic Company.
2. Standard: UL 1091.
3. Pressure Rating: 175 psig (1200 kPa).
4. Body Material: Cast or ductile iron.
5. Style: Lug or wafer.
6. End Connections: Grooved.

E. Check Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Globe Fire Sprinkler Corporation.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Potter Roemer.
 - e. Reliable Automatic Sprinkler Co., Inc.
 - f. Tyco Fire & Building Products LP.
 - g. Watts Water Technologies, Inc.
2. Standard: UL 312.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

F. Bronze OS&Y Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. United Brass Works, Inc.
2. Standard: UL 262.
3. Pressure Rating: 175 psig (1200 kPa).
4. Body Material: Bronze.
5. End Connections: Threaded.

G. Indicating-Type Butterfly Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:

- a. Anvil International, Inc.
 - b. Global Safety Products, Inc.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
2. Standard: UL 1091.
 3. Pressure Rating: 175 psig (1200 kPa) minimum.
 4. Valves NPS 2 (DN 50) and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
 5. Valves NPS 2-1/2 (DN 65) and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
 6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

H. NRS Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Crane Co.; Crane Valve Group; Stockham Division.
 - b. Mueller Co.; Water Products Division.
 - c. NIBCO INC.
 - d. Tyco Fire & Building Products LP.
2. Standard: UL 262.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Body Material: Cast iron with indicator post flange.
5. Stem: Non-rising.
6. End Connections: Flanged or grooved.

2.4 TRIM AND DRAIN VALVES

A. General Requirements: Angle, Ball, and Globe valves:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig (1200 kPa) minimum.
3. Body material: Bronze
4. End Connections: Threaded

B. Angle Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Fire Protection Products, Inc.

b. United Brass Works, Inc.

C. Ball Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Watts Water Technologies, Inc.

D. Globe Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

2.5 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
 - a. Standard-Pressure Piping Specialty Valves: 175 psig (1200 kPa) minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic (Ball Drip) Drain Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. AFAC Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
2. Standard: UL 1726.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4 (DN 20).
6. End Connections: Threaded.

C. Backflow Preventer: Provided and installed in the underground fire water service by the civil utilities contractor.

D. Fire Department Connection: Siamese type, mounted on the exterior wall of the fire pump room.

2.6 SPRINKLER SPECIALTY PIPE FITTINGS

A. Sprinkler Inspector's Test Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. AGF Manufacturing Inc.
 - b. Triple R Specialty.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

B. Adjustable Drop Nipples:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. CECA, LLC.
 - b. Corcoran Piping System Co.
 - c. Merit Manufacturing; a division of Anvil International, Inc.
2. Standard: UL 1474.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

C. Flexible, Sprinkler Hose Fittings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Fivalco Inc.
 - b. FlexHead Industries, Inc.
 - c. Gateway Tubing, Inc.
2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175 psig (1200 kPa) minimum.
5. Size: Same as connected piping, for sprinkler.

2.7 SPRINKLERS (See Section 3.12 for Sprinkler Schedule)

- ### A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire & Building Products LP.
4. Victaulic Company.
5. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig (1200 kPa) minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Quick-Response.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated on the design drawings or required by application.

D. Sprinkler Guards:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators: (Flow Switches)

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. McDonnell & Miller; ITT Industries.
 - b. Potter Electric Signal Company.
 - c. Viking Corporation.
 - d. Watts Industries.
2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for 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 if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig (1725 kPa).
7. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches: (Tamper Switches)

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
 - a. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.9 PRESSURE GAGES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
1. Ashcroft, Inc.
 2. Brecco Corporation.
 3. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- D. Pressure Gage Range: 0 to 250 psig (0 to 1725 kPa) minimum.
- E. Water System Piping Gage: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 (2019 Edition) and the latest edition of NFPA 291. Use results for system design calculations.
- B. Report test results promptly and in writing to the Architect, Owner, General Contractor, and all authorities having jurisdiction.

3.2 SERVICE-ENTRANCE PIPING

- A. Connect fire pump suction piping to underground water-service. Underground water service shall be provided and installed, to within 5'-0" of the fire pump room, by the civil utilities contractor. Coordinate with the utilities contractor to verify that the required flushing and testing of underground service has been performed and recorded, prior to making final connection.

3.3 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13 (2019).
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13 (2019).
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install automatic (ball drip) drain valve at fire-department connection, to drain piping between fire-department connection and check valve.
- I. Install alarm devices in piping systems.
- J. Install hangers and supports for sprinkler system piping according to NFPA 13 (2019). Comply with requirements for hanger materials in NFPA 13 (2019).
- K. Install pressure gages on riser or feed main, at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.
- L. Fill sprinkler system piping with water.
- M. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- N. Install fire stopping at all penetrations of fire rated structure in order to maintain the rating of the structure.

3.4 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems. Provide dielectric adapters as required.

3.5 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 (2019) and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. See sprinkler control riser detail on design drawings.

3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry barrel sprinklers, with water supply from heated space, for protection of areas subject to freezing. Dry barrel lengths and installation shall comply with NFPA 13 (2019) requirements. Do not install wet-type sprinklers in areas subject to freezing.
- C. Flexible drop assembly arm-over/sprinkler head connections are acceptable.

3.7 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13 (2019), "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports and deliver copies to Architect, Owner, and authorities having jurisdiction.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain system. Maintain a list of personnel who completed the training. Provide a copy of the list to the owner's representative.
- B. Provide a copy of NFPA-25 "Standard for the Inspection, Testing, and Maintenance of Water-based Fire Protection Systems," to the Owner's representative.

3.10 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.11 PIPING SCHEDULE

- A. Standard-pressure, wet-pipe sprinkler system, NPS 2 (DN 50) and smaller, shall be one of the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- B. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:
 - 3. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.9 SPRINKLER SCHEDULE

- A. Use sprinkler types below for the following applications:
1. Rooms without Ceilings (open to structure): Upright sprinklers. Rough brass.
 2. Rooms with Suspended Ceilings (Acoustical Lay-in Tiles): Pendent; Recessed; Factory off-white finish. Sprinklers shall be centered in acoustical tiles. Provide extra sprinklers in order to meet this requirement. Consult architectural reflected ceiling plans for ceiling types and details. The design engineer shall make the final decision for the type, number and location of sprinklers.
 3. Rooms with Hard ceilings: Pendent; Concealed; Rough Brass; Factory painted off-white cover plate. Sprinklers in hard ceilings shall be centered in relation to lights and HVAC grilles. Provide extra sprinklers in order to meet this requirement. Consult architectural reflected ceiling plan for ceiling types and details. Coordinate with all disciplines. The design engineer shall make the final decision for type, number and location of sprinklers.
 4. Wall Mounting: Sidewall; Pendent; Factory off-white finish.
 5. Areas subject to freezing: Dry barrel sprinklers connected to wet system piping located in heated space. Sprinklers with flexible dry barrels are acceptable.
 6. Provide factory escutcheons to match sprinklers.

3.13 PROJECT CLOSE-OUT

- A. Prior to issuance of certificate for final payment, submit to Architect, and design engineer, and obtain approval of the following:
1. A letter signed by the subcontractors for fire sprinkler and electrical work stating that they have jointly checked each power circuit, alarm circuit, and control circuit, and mutually agree that each item is properly wired, and that power, alarm, and control circuits function properly.
 2. Record Drawings (As-Built Drawings) – Fire sprinkler piping (ACAD 2010 or higher).
 3. Record Drawings (As-Built Drawings) – Fire sprinkler head locations (ACAD 2010 or higher).
 4. Water and Air Pressure tests for fire sprinkler systems.
 5. Equipment Submittal Data (3 copies).
 6. Equipment Operating and Maintenance Manuals (3 copies).
 7. Maintenance Schedule (3 copies).
 8. Equipment Warranty dates and Guarantee (3 copies).
 9. List of Owner's Personnel who have received maintenance training.

END OF SECTION

SECTION 14425 - SHAFTWAY VERTICAL PLATFORM WHEELCHAIR LIFT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Vertical platform wheelchair lift installed within shaftway.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Concrete shaftway and anchor placement.
- B. Section 04800 - Masonry Assemblies: Masonry shaftway and anchor placement.
- C. Section 06100 - Rough Carpentry: Blocking in framed construction for lift attachment.
- D. Section 09260 - Gypsum Board Assemblies: Gypsum board shaftway.
- E. Division 16 - Electrical: Dedicated telephone service and wiring connections.
- F. Division 16 - Electrical: Lighting and wiring connections at top of shaft.
- G. Division 16 - Electrical: Electrical power service and wiring connections.

1.3 REFERENCES

- A. ASME A17.1 - Safety Code for Elevators and Escalators.
- B. ASME A17.5 - Elevator and Escalator Electrical Equipment.
- C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
- D. CSA B44 - Safety Code for Elevators and Escalators.
- E. CSA B355 - Lifts for Persons with Physical Disabilities.
- F. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- G. NFPA 70 - National Electric Code.
- H. CSA - National Electric Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
 - 2. Include complete description of performance and operating characteristics.
 - 3. Show maximum and average power demands.
- C. Shop Drawings:
 - 1. Show typical details of assembly, erection and anchorage.
 - 2. Include wiring diagrams for power, control, and signal systems.
 - 3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.
- D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. E. Verification Samples: For each finished product specified, two samples, minimum size 1-3/4" x 2-1/4", representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with minimum 20 year's experience in manufacturing of vertical platform wheelchair lifts, with evidence of experience with similar installations of type specified.
- B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

1.6 REGULATORY REQUIREMENTS

- A. Provide platform lifts in compliance with:
 - 1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
 - 2. ASME A17.1 - Safety Code for Elevators and Escalators.
 - 3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
 - 4. NFPA 70 - National Electric Code.
- B. Provide platform lifts in compliance with:
 - 1. CSA B355 - Lifts for Persons with Physical Disabilities.
 - 2. CSA B44.1/ASME A17.5 - Elevator and Escalator Electrical Equipment.
 - 3. CSA - National Electric Code.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

- A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

- A. Warranty: Manufacturer shall warrant the wheelchair lift materials and factory workmanship for two years following completion of installation.
- B. Extended Warranty: Provide an extended manufacturer's warranty for the entire warranty period covering the wheelchair lift materials and factory workmanship for the following additional extended period beyond the initial two-year warranty. Preventive Maintenance Agreement required.
 - 1. One additional year.
 - 2. Five additional years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Garaventa Lift; United States - P.O. Box 1769, Blaine, WA 98231-1769. Canada – 18920 – 36th Ave., Surrey, BC V3Z 0P6. ASD. Toll Free: 800-663-6556. Tel: (604) 594-0422 Fax: (604) 594-9915; Email: productinfo@garaventallift.com Web: www.garaventallift.com.
- B. Equal products of other manufacturers may be used in the work, provided such products have been approved by the Architect, not less than Ten (10) days prior to scheduled bid.

2.2 SHAFTWAY VERTICAL WHEELCHAIR LIFT

- A. Capacity: 750 lbs (340 kg) rated capacity.
- B. Mast Height:

1. Model GVL SW -120; 123 inches (3124 mm) maximum lifting height.
- C. Nominal Clear Platform Dimensions:
1. Large: 42 inches (1167 mm) by 60 inches (1524 mm).
- D. Platform Configuration:
1. Straight Through Entry/Exit: Front and rear openings.
- E. Landing Openings:
1. Lower Landing: Door.
 2. Upper Landing: Door.
- F. Door Construction:
1. Fire Rated Doors: 1-1/2 hour B label rating. Pre-hung, constructed of 16 gauge (1.5 mm) steel, with a vision panel, delayed action door closer, pull handle and integrated interlock. Doors mount flush to the inside wall of the shaftway.
 2. Non-Rated Doors: Pre-hung, on an extruded aluminum frame, with a door closer, pull handle, integrated interlock and constructed with a 16 gauge (1.5 mm) galvanized steel kick plate and upper panel as follows:
 - a. Panels of smoked grey Plexiglas.
 - b. D-Handle Pull: 12 inch (305 mm) offset D-Handle.
 3. Door Width:
 - a. Lower Landing:
 - 1) 35-5/8 inches (905 mm).
 - b. Upper landing:
 - 1) 35-5/8 inches (905 mm).
- G. Upper Gate Construction
1. 42 inches (1067 mm) high, pre-hung on an extruded aluminum frame, fitted with a door closer, pull handle, integrated interlock and constructed with a 16 gauge (1.5 mm) galvanized steel kick plate and upper panel as follows:
 - a. Panels of smoked grey Plexiglas.
- H. Power Door Operator: Automatically opens the door/gate when platform arrives at a landing. Will also open at landing by pressing call button.
1. ADA Compliant and obstruction sensitive.
 2. Low voltage, 24 VDC with all wiring concealed.
 3. Provide power operators at the following locations:
 - a. Lower Landing: Door.
 - b. Upper landing: Door or Gate.
- I. Lift Components:
1. Machine Tower: Extruded aluminum.
 2. Base Frame: Structural steel tubing.
 3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet. Aluminum extrusion tube frame.
- J. Base Mounting and Access to Lift at Lower Landing:

1. Floor Mount: Base of lift shall be mounted on the floor surface of the lower landing. For access onto the platform provide a ramp of 16 gauge (1.5 mm) galvanized steel sheet with a slip resistant surface.
 2. Pit Mount: Lift to be mounted in pit with dimensions to meet manufacturer's requirements for the platform size specified. Pit construction shall be in accordance to Section 03300.
- K. Infill Panel Kit: Provide 16 gauge (1.5 mm) galvanized panels and mounting hardware to cover void between side of enclosure, drive mast and adjacent wall at all landings including but not limited to the following locations:
1. Lower landing.
 2. Upper landing.
- L. Drive Mast Side Wall Panels: Provide 16 gauge (1.5 mm) galvanized panels and mounting hardware to cover the void between both sides of the mast and the side of the shaftway. Panels to cover the front and top of the void area to the height of the top surface of the drive mast.
- M. Hydraulic Drive:
1. Drive Type: Chain hydraulic.
 2. Emergency Operation: Manual device to lower platform and auxiliary battery power to raise or lower platform.
 3. Safety Devices:
 - a. Slack chain safety device.
 - b. Shoring device.
 4. Travel Speed: 17 fpm (5.2 m/minute).
 5. Motor: 3.0 hp (2.2 kW); 24 volts DC.
 6. Power Supply:
 - a. 120 VAC single phase; 60 Hz on a dedicated 15-amp circuit.
 - b. 208/240 VAC, single phase; 50 Hz on a dedicated 16-amp circuit.
 - c. Powered by continuous building mains converted to 24 VDC equipped with auxiliary battery power system capable of running lift up and down for a minimum of 5 trips with rated load. Required for high usage lifts.
 - d. Powered by continuously charged battery system.
- N. Platform Controls: 24 VDC control circuit with the following features.
1. Direction Control: Continuous pressure rocker switch.
 2. Direction Control: Illuminated tactile and continuous pressure buttons with dual platform courtesy lights and safety light.
 3. Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm equipped with battery backup.
 4. Keyless operation.
 5. Keyed operation.
 6. Emergency Telephone: Platform shall be equipped with ADA compliant autodialer telephone with a stainless-steel faceplate. Telephone shall operate in the event of power failure. A telephone line shall be supplied to the lift site as specified under Division 16.
 7. Arrival Gong and Digital Floor Display.
- O. Call Station Controls: 24 VDC control circuit with the following features.
1. Direction Control: Continuous pressure switches.

2. Direction Control: Illuminated and tactile continuous pressure buttons with illuminated "in-use" indicator.
 3. Safety indicator lamp.
 4. Keyless operation.
 5. Keyed operation.
 6. Call Station Mounting:
 - a. Lower:
 - 1) Wall mounted recessed.
 - b. Upper:
 - 1) Wall mounted recessed.
- P. Safety Devices and Features:
1. Grounded electrical system with upper, lower, and final limit switches.
 2. At all landings a solenoid activated interlock shall electrically monitor that the door is in the closed position and the lock is engaged before lift can move from landing.
 3. Pit stop switch mounted on mast wall.
 4. Electrical disconnect shall shut off power to the lift.
- Q. Finishes
1. Extruded aluminum electrostatically applied baked powder finish semi matte Silver Moon.
 2. Ferrous Components: Electrostatically applied baked powder finish, semi matte.
 - a. Color: Silver Moon.
 3. Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.
- R. Complete Installation Requirements:
1. The Contractor shall be responsible for providing all filler panels and accessories as required, whether indicated on drawings/specifications or not, for a complete professional installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify shaft and machine space are of correct size and within tolerances.
- C. Verify required landings and openings are of correct size and within tolerances.
- D. Verify electrical rough-in is at correct location.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install platform lifts in accordance with applicable regulatory requirements including ASME A17.1, ASME A18.1 and the manufacturer's instructions.

- B. Install platform lifts in accordance with applicable regulatory requirements including CSA B355, and manufacturer's instructions.
- C. Install system components and connect to building utilities.
- D. Accommodate equipment in space indicated.
- E. Startup equipment in accordance with manufacturer's instructions.
- F. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

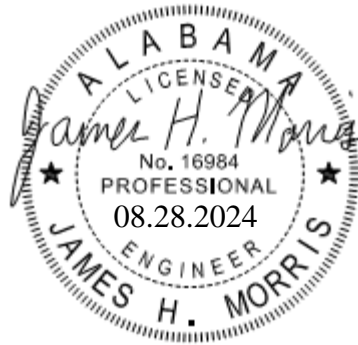
- A. Perform tests in compliance with ASME A17.1 or A18.1 and as required by authorities having jurisdiction.
- B. Perform tests in compliance with CSA B355 and required by authorities having jurisdiction.
- C. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 15 SPECIFICATIONS



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SECTION 15050 - GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for the HVAC systems.

1.2 QUALIFICATIONS OF SUB-CONTRACTORS

- A. Must be properly licensed and established as a Heating and Air Conditioning Contractor at the location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least three systems of this type and size.

1.3 SCOPE

- A. Include all equipment, material and labor required for complete operation of heating, air conditioning and ventilation systems, even though every item involved is not indicated. Included in the scope but not limited by the scope are the following complete new operating systems.

1.4 CODES

- A. Comply with applicable 2015 International Building Code, 2015 International Mechanical Code and 2013 ASHRAE 90.1 requirements and conform to ordinances and codes of the locality. Where conflicts occur between code and construction drawings or specifications, most stringent requirements shall apply. Any work provided contrary to these requirements shall be removed and replaced at contractor's expense.

1.5 PERMITS

- A. Provide all permits and arrange for inspections as required by local, city, county and state authorities. Furnish certificate of final inspection from local building inspector indicating that installation complies with all regulations governing the same. Provide additional materials, parts, labor, etc. and modify the work as required by city and state inspections and regulations.

1.6 DRAWINGS

- A. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings, and lay out work so as to fit with ceiling grids, lighting, and other parts. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- B. The Plans are not intended to show all ductwork, pipes valves, fittings, connections, and details of the work to be done. The piping, duct and equipment locations shall be adhered to as closely as possible; however, any changes necessary to avoid columns, beams, lighting fixtures, ductwork, sprinkler piping, etc., shall be made at no additional cost to the owner. Do not scale plumbing or HVAC drawing. Refer to Architectural drawings for dimensions.

1.7 CHANGES AND CONFLICTS

- A. If during construction desirable or necessary changes become apparent, advise the Architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.

1.8 WARRANTY

- A. Contractor shall provide a one-year full parts and labor warranty for materials and workmanship for all items starting at substantial completion of entire project. The following items, but not limited to the following, shall have extended warranties remain in effect past the one-year warranty. All warranty shall start at substantial completion of entire project.

1. AC Equipment:

Provide one-year parts and labor warranty for entire system.

Provide five-year parts and labor warranty for compressors.

2. Control System - Provide two-year parts and labor warranty for entire system.
3. Filters - Contractor shall change all filters every two months for first year.

1.9 MISCELLANEOUS REQUIREMENTS

- A. Materials and Equipment: New and of best quality in every respect. All pipes and fittings shall conform to the ASTM Standard designated for pipe of each material.

Equipment shall be essentially the standard product of the manufacturer and shall be UL approved where required by Code. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be.

- B. Listed Equipment: Being listed as "A supplier of comparable products" means the listed manufacturer will receive consideration if in accordance with all documents, delivery, and space requirements. Being listed does not indicate nor imply the manufacturer's equipment is acceptable for the project. Only the "Base" manufacturer's equipment has been verified for compliance with the documents. The burden of approval of the equipment rests solely with the contractor.

- C. Equipment Protection: Protect during construction, duct openings against the entrance of foreign materials and protect all equipment from damage by mortar, paint, weather, etc. Damaged equipment shall be replaced at no expense to project. Make provisions to protect equipment.

- D. Finishes: Manufacturer's standard unless otherwise stated. Submit color cards for selection where such choice is specified or available.

- E. Charges, Grease, Filters, Etc.: Furnish first charges of refrigerant grease, oils, etc., and be responsible for such full charges for the guarantee period, except when loss is due to negligence of Owner. Where disposable type filters are specified, furnish two sets for each air conditioning unit; one set to be used during test period, other set to be installed just prior to occupancy. Contractor shall change all disposable filters every two months for first year. Sets of filters to be installed during one-year guarantee period. Where permanent type is specified, provide disposable type for testing and operating prior to occupancy. Provide Owner a typed list (O & M Manual) of all filter sizes and required quantity.

- F. Cleaning and Adjusting: Upon completion of work, clear drains, traps, ducts, and pipelines. Adjust all valves, remove rubbish, and leave work in clean and operating condition. Install final permanent type filters only after cleaning of building is completed.

- G. Cutting and Patching: Openings are to be laid out and built in; furnish detailed layout drawings to other trades in advance of their work. Piping within or behind walls must be installed before wall is erected.

Otherwise, walls, etc. affected must be reworked by trade which erected same at expense of HVAC Contractor; chasing and cutting of new work will not be accepted. HVAC Contractor shall prepare shop drawings of required opening to General Contractor and Architect for review.

- H. Foundations: Provide foundations, supports, etc., not specified under other Sections, and as required to mount equipment in a workman like and structurally sound manner. Consult drawings pertaining to other trades to determine extent of their work.
- I. Roof Flashing: Roofing work is specified under Roofing Section. Roofer shall be advised of all requirements and all furnished items to be installed before roofing is installed. Roofer shall install all mechanical roof penetration and provide full roof warranty.
- J. Vibration and Noise Control: All items of mechanical equipment including air handling units, and fans shall be properly isolated from the structure by means of approved vibration absorbing accessories, foundations or supports.
Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, etc., required thereby. Pay special attention to vibration problems at year end inspection and correct all deficiencies noted.
- K. Operating and Maintenance Instructions: Provide the services of a competent person to thoroughly instruct representatives appointed by the owner in the proper operation and care of all equipment and control systems. Furnish a complete set of Operating and Maintenance (O & M Manuals) instructions in 3 copies (including equipment data, spare parts lists, operating instructions, filter sizes, valves services, control, and wiring diagrams) in bound folder form prior to final acceptance. O & M Manuals, Test and Balance report to be submitted 2 weeks prior to final inspection.
- L. Painting and Finishing: Clean and paint with two coats of asphalt varnish all exposed ferrous metal parts of mechanical equipment located above ceilings, etc.). Surfaces in finished areas are to be painted by Painting Contractor. Where factory finished items are marred or scratched item must be replaced, or upon approval, may be refinished or touched-up as required to bring to a like-new condition.
- M. Where device occurs above a lift-out acoustical ceiling panel, identify the panel with a 3/8" #8 round head self-threading sheet metal screw, screwed into panel with only the head showing. Before inserting, paint head of screw with appropriate color as specified under Pipe Identification and Color Coding. Furnish sample for approval.
- N. Dis-similar Metal: Separate all dis-similar metals as required for services. Dis-similar metal shall not touch.
- O. Coordination:
 - 1. Mechanical contractor shall submit written verification that he has coordinated all electrical requirements for HVAC with electrical subcontractor. Written document shall indicate any difference between design requirements and actual verified requirements and shall recommend solutions to any conflicts found. Refer to "EXAMPLE" form at end of this section.

NOTE: Mechanical submittals will not be reviewed without this document included.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION

See Attachment A

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SECTION 15050A - ATTACHMENT "A"

New Gymnasium at Appalachian School
for the Blount County Board of Education
Appalachian, Alabama

ATTACHMENT "A"

1 of 1

MCKEE PROJECT NO. 24.169

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Morris Davis Engineering LLC

James H. Morris, P.E. - Mechanical
Hunter B. Davis, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: XYZ High School - Montgomery, AL DATE: 1-10-11

EQUIP. MARK	DESIGN CHARACTERISTICS				SUBMITTED REQUIREMENTS				CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION		
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR			DISC SW	FEEDER SIZE
AH-1	208/3	2 HP	15/3P	30A3P	3#12 & 1#12(G)-1/2" c	208/3	3 HP	20/3P	30A3P	3#12 & 1#12(G)-1/2" c	Y	Change 15/3 CB to 20/3 CB
AH-2	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4" c	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4" c	N	
ACCU-7	208/3	45.3A	60/3P	60A3P	3#6 & 1#10(G)-3/4" c	208/3	43.7A	60/3P	60A3P	3#6 & 1#10(G)-3/4" c	N	
ACCU-9	208/3	15.2A	20/3P	30A3P	3#12 & 1#12(G)-1/2" c	208/3	18.1A	30/3P	30A3P	3#10 & 1#10(G)-3/4" c	Y	See Note 1 below.
CH-1	480/3	155A	200/3P	N/A	3#3/0 & 1 #6(G)-2" c	480/3	183A	250/3P	N/A	3#250M&1#4(G)-2 1/2" c	Y	See Note 2 below.

NOTES:

- ACCU-9 - Change 20/3P CB to 30/3P CB and change circuit to 3#10&1#10G-1/2" c.
- CH-1 - Change 200/3P CB to 250/3P CB and change circuit to 3#250 MCM&1#4G-2 1/2" c.

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

James Doe
Electrical Contractor

Henry Smith
Mechanical Contractor

Joe Thomas
Plumbing Contractor

ABC Electric, Inc.
Company

Smith Heating & Air
Company

Joe's Plumbing Company
Company

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Morris Davis Engineering LLC

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903 South Perry Street
 Montgomery, AL 36104
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COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: _____ DATE: _____

EQUIP. MARK	DESIGN CHARACTERISTICS				SUBMITTED REQUIREMENTS				CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION		
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR			DISC SW	FEEDER SIZE

NOTES:

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

Electrical Contractor _____ Mechanical Contractor _____ Plumbing Contractor _____
 Company _____ Company _____ Company _____

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SECTION 15052 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
 2. Dielectric fittings.
 3. Mechanical sleeve seals.
 4. Sleeves.
 5. Escutcheons.
 6. Grout.
 7. Equipment installation requirements common to equipment sections.
 8. Concrete bases.
 9. Supports and anchorages.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

- C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Carbon steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink, and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 4. PVC Non-pressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout on concrete bases and provide smooth bearing surface for equipment.
- F. Place grout around anchors.
- G. Cure placed grout.

3.9 GENERAL

- A. General and Special Conditions: Refer thereto for all applicable provisions.
- B. Scope: Include all equipment, material and labor required for complete operating plumbing, and gas, even though every item involved is not indicated.
- C. Codes: Comply with 2021 International Plumbing Code, 2021 International Building Code, ADA, LEED specifications sections 18A through 18D, and OSHA of the locality. Where conflicts occur between code and contract drawings or specifications, most stringent requirements shall apply.
- D. Qualifications: Sub-contractor shall be licensed plumber and gas pipe fitter in the locality.
- E. Permits: Provide all permits and arrange for inspections as required by city, county, and state authorities.
- F. Drawings: In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, fittings, and equipment with the detail architectural,

structural, and electrical drawings and layout work so as to fit in with other parts. Where doubts arise as to the leaning of the plans and specifications, obtain the Architect's decision before proceeding with parts as may be affected; otherwise, the Contractor shall be liable for damage to work and for removing and repairing his own work in proper manner.

- G. Changes: If during construction, desirable or necessary changes become apparent, advise the architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.
- H. Existing Conditions: Bidders shall visit site and become acquainted with all job conditions. No consideration will be given after bid opening for alleged misunderstanding regarding utility connections, permits, fees, etc.
- I. Prior Approval: Bidders shall submit equipment for prior approval 10 days before bid date.
- J. Warranty: Guarantee in writing to make good without cost any defects in materials and workmanship within one year from the date of acceptance of project.
- K. Low – Emitting Materials – Adhesives and Sealants: All adhesives and sealants shall comply with LEED 2015 for New Construction Reference Guide. See credits IEQ4.1 and IEQ4.2.
- L. Low – Emitting Materials – Paints and Coatings: All paints and coatings shall comply with LEED 2015 for New Construction Reference Guide. See credits IEQ4.1 and IEQ4.2.
- M. Submittals:
 - 1. Within 25 days the award of the contract and before any orders are planned, the contractor shall submit to the Architect for approval seven (7) copies of a complete list of all proposed materials and all equipment, include catalog data, capacities, model numbers, any accessories, and any pertinent information to indicate full compliance with specification and drawings. Partial list will not be accepted. Rejected items shall be resubmitted until approval has been obtained.
 - 2. The contractor shall submit shop drawings on the following items but not limited to the following items.
 - a. List of proposed materials and equipment.
 - b. Letter stating coordination of plumbing, mechanical and electrical work, signed by plumbing, mechanical, electrical, and general contractors. Submittals and shop drawings will not be reviewed without receipt of this item.
 - c. Shop drawing showing coordination of Plumbing and Electrical.
 - d. Showing drawing of Plumbing of a scale of not less than 1/8-inch equals one foot. The drawing shall show coordination with all HVAC, lighting, conduit, equipment, & etc.
 - e. Pipe hanger shop drawings including methods of attachment to structure anchors.
 - f. Schedule of insulation to be used including thickness. Submittal literature on all insulation, mastics, and materials. Include flame spread and smoke developed ratings.
 - g. Access panels.
 - h. Notify Architect of all pressure tests to be preformed.
 - i. Water closets and accessories.
 - j. Lavatories and accessories.
 - k. Urinals and accessories.
 - l. Type water piping and accessories (interior and exterior)
 - m. Type sanitary drain and vent piping and accessories
 - n. Water heaters and accessories.
 - o. Electric water cooler and accessories.

- p. Hand sinks and accessories.
- q. Cleanouts (wall, floor, etc)
- r. Floor drains
- s. Valves
- t. Water hammer arrestor
- u. Hydrants
- v. Trap Guard & Trap Primer
- w. Mop basin and accessories.
- x. Showers and accessories.
- y. Gas piping and accessories.
- z. Sinks and accessories.
- aa. Washing machine trench drain & CW/HW hose bibbs

3.10 PROJECT CLOSE-OUT:

- A. Prior to issuance of certificate for final payment, submit to Architect and obtain his approval of the following:
 - 1. A letter signed by the subcontractors for plumbing and electrical work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired, and that controls and power circuits will function properly.
 - 2. Record drawings – waste and vent piping (ACAD 2015 or higher).
 - 3. Record drawings – water piping (ACAD 2015 or higher).
 - 4. Record drawings – gas, and miscellaneous systems (ACAD 2015 or higher).
 - 5. Loose tee keys for wall hydrants shall be turned over to owner.
 - 6. Water/Air pressure test for waste and water systems.
 - 7. Equipment submittal data (3). Furnish in searchable .pdf format.
 - 8. Equipment Operating and Maintenance Manuals (3).
 - 9. Maintenance schedule (3).
 - 10. Equipment warranty dates and guarantee (3).
 - 11. List of Owner's Personnel who have received maintenance training.

END OF SECTION

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SECTION 15061 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.
- B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.

3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3. GS Metals Corp.
 - 4. Power-Strut Div.; Tyco International, Ltd.
 - 5. Thomas & Betts Corporation.
 - 6. Tolco Inc.
 - 7. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation inserts encased in sheet metal shield.
- B. Manufacturers:
 - 1. Carpenter & Paterson, Inc.
 - 2. ERICO/Michigan Hanger Co.
 - 3. PHS Industries, Inc.
 - 4. Pipe Shields, Inc.
 - 5. Rilco Manufacturing Company, Inc.
 - 6. Value Engineered Products, Inc.

- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. MasterSet Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
 - 7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 - 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
 - M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
 - N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
 - 5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
 - 6. Insert Material: Length at least as long as protective shield.
 - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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SECTION 15076 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 SUBMITTAL

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

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

- B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 VALVE TAGS

- A. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings as specified under 1510 B.6.
- B. Provide location labels on ceiling grid for all valves above ceiling plastic label with adhesive backing 3.2mm thick. Provide engraved valve tag #. Background color white. Letter color red for HW. Blue for CW. Black for HWR 1/4" high letters.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 9 Section "Interior Painting."
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
2. Storm Drainage Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
3. Domestic Hot Water Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
4. Gas Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

- D. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings.

END OF SECTION

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SECTION 15077 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Duct labels.

1.2 SUBMITTAL

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

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service (DHP-#).
- B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

Pipe Label Contents: Include identification of branch controller port and indoor unit using same

designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Refrigerant Pipe O.D. $\frac{3}{4}$ " – 1-1/4" = Lettering Size $\frac{1}{2}$ " high.
2. Refrigerant Pipe O.D. 1-1/2" – 2" = Lettering Size $\frac{3}{4}$ " high.
3. Refrigerant Pipe Above 2" = Lettering Size 1" high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 9 Section "Interior Painting."
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 1. Near each valve and control device.
 2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 3. At access doors, manholes, and similar access points that permit view of concealed piping.
 4. Near major equipment items and other points of origination and termination.
 5. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
 6. On piping above removable acoustical ceilings.
- C. Pipe Label Color Schedule:
 1. Refrigerant Piping:
 - a. Background Color: Purple.
 - b. Letter Color: White.

END OF SECTION

SECTION 15082 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulation Materials:
 - a. Mineral fiber.
 - 2. Insulating cements.
 - 3. Adhesives.
 - 4. Mastics.
 - 5. Field-applied jackets

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.
 - 8. Detail field application for each equipment type.
- C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Insulation to be installed by Licensed Insulation Contractor.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000 Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Insulco, Division of MFS, Inc.; SmoothKote.
 - b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
 - c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

- A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.
 2. Factory cut and rolled to size.
 3. Finish and thickness are indicated in field-applied jacket schedules.
 4. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
 5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

6. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.

 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation,

- install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt

- each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

- A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

- C. Color: Final color as selected by the Contracting Officer. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect field-insulated equipment, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 - 2. Inspect pipe, fittings, strainers, and valves, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
 - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
- B. Domestic Chilled Water (Potable): Insulation shall be the following:
 - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.
- C. Stormwater and Overflow: Insulation shall be the following:
 - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

D. Roof Drain and Overflow Drain Bodies: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

END OF SECTION

SECTION 15086 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Supply air.
 - 2. Return air.
 - 3. Outdoor air.
- B. Related Sections:
 - 1. Division 15 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.
- C. Qualification Data: Independent insulation contractor.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
 - 2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
 - 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 - 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
 - 2. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
 - 3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 - 4. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: Aluminum.

2.5 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches (75 mm).
 2. Thickness: 6.5 mils (0.16 mm).
 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.6 SECUREMENTS

- A. Bands:
1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing seal.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces, free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation,

- install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
- D. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
 2. Seal penetrations through fire-rated assemblies.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic

applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Supply air.
 2. Return air.
 3. Outdoor air.
- B. Items Not Insulated:
 1. Metal ducts with duct liner of sufficient thickness to comply with energy code.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums and casings.
 4. Vibration-control devices.
 5. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.2 inches (56 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density. First 15' from AHU shall be internally lined with flexible elastomeric, 1" thick.
- B. Return-air duct insulation and outdoor air insulation shall be the following:
 1. Mineral-Fiber Blanket: 2.2 inches (56 mm) thick and 0.75-lb/cu. ft (12-kg/cu m) nominal density. First 15' from AHU shall be internally lined with flexible elastomeric, 1" thick.

END OF SECTION

SECTION 15088 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Refrigerant suction and hot-gas piping, indoors and outdoors.
 - 2. Condensates drain piping, indoors.
- B. Related Sections:
 - 1. Division 15 Section "Duct Insulation."

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties.
 - 6. Detail application at linkages of control devices.
- C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 / NFPA 255, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2.2 FLEXIBLE ELASTOMERIC AND POLYOLEFIN ADHESIVES

- A. Basis-of Design Product: Subject to compliance with requirements, provide Armacell LLC; ArmaFlex 520 Adhesive or comparable product.
- B. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- C. Adhesive formulated for Flexible Elastomeric Insulation: Synthetic rubber base with synthetic resins, black air -drying contact adhesive, Comply with ASTM G21/C1338.

2.3 PIPE SUPPORTS

- A. Material: PET-foam load bearing core, flexible closed cell preformed insulation on the outer part for connection. Outside cladding made of PVC foil.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Mechanical systems shall be turned off before insulating piping. Wait 36 hours after insulating for the adhesive to cure before restarting mechanical system.
- B. Surface Preparation: Clean all dust, dirt, oil and water from pipework using denatured alcohol and dry surfaces prior to insulation. Remove materials that will adversely affect insulation application.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Installation shall comply with ASTM C1710 "Standard Guide for Installation of Flexible Closed Cell Preformed Insulation in Tube and Sheet Form"
- B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs. All joints shall be sealed with adhesive recommended by insulation material manufacturer. Do Not Tape
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.

- J. Where pipe supports are required. Provide as specified and install per manufacturer's recommendations. Maintain a complete vapor barrier.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- O. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.
 - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.

3.3 PIPING PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
- C. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.

3.4 PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric, black, 3/4-inch wall thickness.
- B. Condensate Drain Piping: Flexible elastomeric, 1/2 inch (13 mm) thick.

END OF SECTION

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SECTION 15093 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. Metraflex Company (The).
 - 4. Pipeline Seal and Insulator, Inc.
 - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 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.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Concrete Slabs above Grade:
 - a. Galvanized-steel-pipe sleeves.
 - 2. Interior Partitions:
 - a. Galvanized-steel-pipe sleeves.

END OF SECTION

SECTION 15098 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- C. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- D. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type, or split-plate.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass, or split-casting brass type with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass, or split-casting brass type with polished, chrome-plated finish.

- g. Bare Piping in Equipment Rooms: One-piece, cast-brass [or split-casting brass] type with polished, chrome-plated finish.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 15111 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.

- B. Related Sections:
 - 1. Division 15 plumbing piping Sections for specialty valves applicable to those Sections only.
 - 2. Division 15 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.

- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- C. Valve Sizes: Same as upstream piping unless otherwise indicated.

- D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
 - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

- E. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Solder Joint: With sockets according to ASME B16.18.

3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jomar Valve (T-100 CG).
 - b. Kitz Corporation.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Red-White Valve Corporation.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two pieces.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE, TFE, or G300.
 - h. Stem: Brass.
 - i. Ball: T.E.A. coated or chrome plated brass.
 - j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jomar Valve (T-200 CSSG)
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Kitz Corporation.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two pieces.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze or stainless steel.
 - i. Ball: Chrome-plated brass or stainless steel.
 - j. Port: Regular.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for butterfly, gate, and globe valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.
 - 1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball valves.
 - 2. Throttling Service: Globe valves.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe:
 - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Bronze Angle Valves: Class 125, bronze disc.
 - 3. Ball Valves: Two-piece, full port, brass, or bronze with brass trim.
 - 4. Bronze Swing Check Valves: Class 125, bronze disc.

5. Bronze Globe Valves: Class 125, bronze disc.

3.5 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two-piece, regular port, brass, or bronze with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Globe Valves: Class 125, bronze disc.

END OF SECTION

SECTION 15126 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Liquid-in-glass thermometers.
 - 3. Thermowells.
 - 4. Dial-type pressure gages.
 - 5. Gage attachments.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product certificates.
- C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of 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. Ashcroft Inc.
 - 2. Miljoco Corporation.
 - 3. Trerice, H. O. Co.
 - 4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - 5. Weiss Instruments, Inc.
- C. Standard: ASME B40.200.
- D. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch (127-mm) nominal diameter.
- E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).
- F. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.
- G. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.
- H. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.

- I. Window: Plain glass.
- J. Ring: Stainless steel.
- K. Element: Bimetal coil.
- L. Pointer: Dark-colored metal.
- M. Accuracy: Plus, or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Miljoco Corporation.
 - b. Trerice, H. O. Co.
 - c. Weiss Instruments, Inc.
- 3. Standard: ASME B40.200.
- 4. Case: Cast aluminum; 7-inch (178-mm) nominal size unless otherwise indicated.
- 5. Case Form: Adjustable angle unless otherwise indicated.
- 6. Tube: Glass with magnifying lens and blue organic liquid.
- 7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
- 8. Window: Glass.
- 9. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
- 10. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
- 11. Accuracy: Plus, or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

- 1. Standard: ASME B40.200.
- 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
- 3. Material for Use with Copper Tubing: CNR.
- 4. Material for Use with Steel Piping: CRES.
- 5. Type: Stepped shank unless straight or tapered shank is indicated.
- 6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
- 7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.

8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ashcroft Inc.
 - b. Miljoco Corporation.
 - c. Terice, H. O. Co.
 - d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - e. Weiss Instruments, Inc.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Ashcroft Inc.
 - b. Miljoco Corporation.
 - c. Terice, H. O. Co.
 - d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - e. Weiss Instruments, Inc.
3. Standard: ASME B40.100.
4. Case: Sealed type(s); cast aluminum or drawn steel; 6-inch (152-mm) nominal diameter.
5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
6. Pressure Connection: Brass, with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
7. Movement: Mechanical, with link to pressure element and connection to pointer.
8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
9. Pointer: Dark-colored metal.
10. Window: Glass.
11. Ring: Metal.
12. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.

- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
 - 2. Inlets and outlets of each domestic water heat exchanger.
 - 3. Inlet and outlet of each domestic hot-water storage tank.
 - 4. Inlet and outlet of each remote domestic water chiller.
- K. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
 - 3. Suction and discharge of each domestic water pump.
- L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- M. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
 - 1. Liquid-filled, bimetallic-actuated type.
 - 2. Industrial-style, liquid-in-glass type.
- B. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).

3.4 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be the following:
 - 1. Sealed, direct-mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:

1. Sealed, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Sealed, direct-mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi (0 to 600 kPa).

END OF SECTION

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SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Water meters.
4. Escutcheons.
5. Sleeves and sleeve seals.

B. Related:

1. New water service piping where water service piping enters the building.
2. Scope: Connect to new 2" water meter serving building and extend to all plumbing fixtures, etc. Provide gate valve in box, backflow preventer and PRV set at 60 PSI. Pay the water works for any and all cost for meter and connections.
3. Arrange with city for service connection to main, etc. pay city cost of service. Provide full size gate valve.

1.2 SUBMITTALS

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

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

- B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.

- 1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

- A. Comply with requirements in Division 15 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.
- B. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
 - 1. Description:
 - a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
 - b. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description:
 - a. Factory-fabricated, bolted, companion-flange assembly.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.6 ESCUTCHEONS

- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
- B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.
- C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.
- D. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

- E. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge.
- F. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- G. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.7 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

2.8 SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.
 - 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: Stainless steel of length required to secure pressure plates to sealing elements.

2.9 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 15 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 15 Section "Domestic Water Piping Specialties" for drain valves and strainers.
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for pressure-reducing valves.
- G. Install domestic water piping level and plumb.

- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.
- L. Install piping adjacent to equipment and specialties to allow service and maintenance.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.
- Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- R. Install thermostats in hot-water circulation piping.
- S. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 15 Section "Meters and Gages for Plumbing Piping" for thermometers.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.
- E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

- G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 15 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 15 Section "Domestic Water Piping Specialties."
 - 1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
 - 2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for balancing valves.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.5 FLEXIBLE CONNECTOR INSTALLATION

- A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 15 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - 3. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 15 "Plumbing Fixtures" for connection sizes.
 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for New Piping:
 1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
 3. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split casting, cast brass with polished chrome-plated finish.
 4. Bare Piping in Unfinished Service Spaces: One-piece, cast brass with polished chrome-plated finish.
 5. Bare Piping in Equipment Rooms: One-piece, stamped steel with set screw or stamped steel with spring clips.
 6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.

- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
- K. Install sleeve materials according to the following applications:
 - 1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
 - 2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.
 - a. Extend sleeves 2 inches (50 mm) above finished floor level.
 - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
 - 3. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
 - b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
 - 4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
 - 5. Sleeves for Piping Passing through Exterior Concrete Walls:
 - a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
 - b. Cast-iron wall pipe sleeves for pipes NPS 6 (DN 150) and larger.
 - c. Install sleeves that are large enough to provide 1-inch (25-mm) annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
- L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Penetration Firestopping" for firestop materials and installations.

3.10 SLEEVE SEAL INSTALLATION

- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
- B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

- A. Identify system components. Comply with requirements in Division 15 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.
- B. Label pressure piping with system operating pressure.

3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- C. Piping Tests:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 - 6. Prepare reports for tests and for corrective action required.
- D. Domestic water piping will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.13 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at

- outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.14 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Under-building-slab, domestic water, building service piping, NPS 3 (DN 80) and smaller, shall be the following:
 1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper solder-joint fittings; and brazed joints.
- C. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 6 (DN 100 to DN 150), shall be the following:
 1. Push-on-joint, ductile-iron pipe; standard-pattern push-on-joint fittings; and gasketed joints.
- D. Under-building-slab, domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:
 1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper solder-joint fittings; and brazed joints.
- E. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.
- F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be the following:
 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and brazed joints.

3.15 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 2. Throttling Duty: Use ball or globe valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.

- 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 15145 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following domestic water piping specialties:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated water mixing valves.
 - 6. Hose bibbs.
 - 7. Wall hydrants.
 - 8. Water hammer arresters.
 - 9. Trap-seal primer valves.
 - 10. Aluminum jacket.
- B. See Division 15 Section "Domestic Water Piping" for water meters.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. NSF Compliance:
 - 1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.

- d. Watts Industries, Inc.; Water Products Div.
 - e. Zurn Plumbing Products Group; Wilkins Div.
3. Standard: ASSE 1001.
 4. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
 5. Body: Bronze.
 6. Inlet and Outlet Connections: Threaded.
 7. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrowhead Brass Products, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Woodford Manufacturing Company.
 - d. Zurn Plumbing Products Group.
3. Standard: ASSE 1001.
4. Body: Bronze, nonremovable, with manual drain.
5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
6. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Double-Check Backflow-Prevention Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; SPX Valves & Controls.
 - d. Flomatic Corporation.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Plumbing Products Group; Wilkins Div.
4. Standard: ASSE 1015.
5. Operation: Continuous-pressure applications, unless otherwise indicated.
6. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.
7. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
8. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
9. Configuration: Designed for horizontal flow.
10. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
Cash Acme.
 - a. Conbraco Industries, Inc.
 - b. Honeywell Water Controls.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Zurn Plumbing Products Group; Wilkins Div.
3. Standard: ASSE 1003.
4. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).
5. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 for NPS 2-1/2 and larger.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and larger.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Lawler Manufacturing Company, Inc.
 - b. Leonard Valve Company.
 - c. Powers; a Watts Industries Co.
 - d. Symmons Industries, Inc.
4. Standard: ASSE 1017.
5. Pressure Rating: 125 psig (860 kPa).
6. Type: Exposed-mounting, thermostatically controlled water mixing valve.
7. Material: Bronze body with corrosion-resistant interior components.
8. Connections: Threaded or union inlets and outlet.
9. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
10. Valve Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.

2.5 LIMITING VALVES

- ### A. Temperature Limiting Valve: Acorn ST70 and Leonard 170D-LF for all lavatories, sinks, etc., or equivalent by Watts, Zurn, Powers, Symmons or T&S.

2.6 HOSE BIBBS

- A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
 2. Body Material: Bronze.
 3. Seat: Bronze, replaceable.
 4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 6. Pressure Rating: 125 psig (860 kPa).
 7. Vacuum Breaker: Integral non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
 9. Finish for Service Areas: Rough bronze.
 10. Finish for Finished Rooms: Chrome or nickel plated.
 11. Operation for Equipment Rooms: Operating key.
 12. Operation for Service Areas: Operating key.
 13. Operation for Finished Rooms: Operating key.
 14. Include operating key with each operating-key hose bibb.
 15. Include integral wall flange with each chrome- or nickel-plated hose bibb.
- B. Hose Bibb (interior) encased narrow wall hydrant in wall box with loose tee key, Zurn Model Z-1350 (narrow wall hydrant) or equal by J. R. Smith, Wade or Josam.

2.7 WALL HYDRANTS

- A. Wall Hydrants (Typical): Freeze proof box type (stainless steel finish) 1/2" nickel plated bronze hose bibb with loose key, J.R. Smith 5509 QT. Install approximately 18" above finished grade.
- A. Non-freeze Wall Hydrants:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Watts Drainage Products Inc.
 - e. Woodford Manufacturing Company.
 - f. Zurn Plumbing Products Group; Light Commercial Operation.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
 3. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
 4. Pressure Rating: 125 psig (860 kPa).
 5. Operation: Loose key.
 6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 7. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
 8. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 9. Box: Deep, flush mounting with cover.
 10. Box and Cover Finish: Polished nickel bronze.
 11. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 12. Nozzle and Wall-Plate Finish: Polished nickel bronze.
 13. Operating Keys(s): One with each wall hydrant.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. PPP Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Tyler Pipe; Wade Div.
 - h. Watts Drainage Products Inc.
 - i. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Copper tube with piston.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.9 TRAP-SEAL PRIMER VALVES

- A. TP: Trap Primer: Watts No. A-200, P.P.P. Inc., JR Smith, Wade or Josam; Mount high up under one lavatory in each toilet that has a floor drain. Install cold water supply with 1/2" piping into wall and below slab to floor drain. Provide 12" x 12" access panels for each trap primer. Comparable products of access panels: Williams Bros., Accudor, and Milcor.
- B. Supply-Type, Trap-Seal Primer Valves:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 3. Standard: ASSE 1018.
 4. Pressure Rating: 125 psig (860 kPa) minimum.
 5. Body: Bronze.
 6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
 7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
 8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
 9. TrapGuard or equal by J.R. Smith Trap Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with airgap fitting, fixed airgap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
 - C. Install balancing valves in locations where they can easily be adjusted.
 - D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 1. Install thermometers and water regulators if specified.
 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
 - E. Install water hammer arresters in water piping according to PDI-WH 201.
 - F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
 - G. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.
 - H. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 1. Double-check backflow-prevention assemblies.
 2. Water pressure-reducing valves.
 3. Primary, thermostatic, water mixing valves.
 4. Supply-type, trap-seal primer valves.
 - I. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Sections.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 1. Test each double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following soil and waste, sanitary drainage, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.3 SUBMITTALS

- A. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Hub-and-Spigot, Cast-Iron Pipe and Fittings: ASTM A 74, Service class.
 - 1. Gaskets: ASTM C 564, rubber.
- B. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Solvent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
 - 2. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
 - b. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
- C. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.
- D. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
 2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, soil, waste, and vent piping shall be the following:
 1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
 2. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- D. Underground, soil, waste, and vent piping shall be the following:
 1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
 2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION

- A. Sanitary sewer piping outside the building is specified.
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

- D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch, and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drainpipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- H. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- I. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

- A. General-duty valves are specified in Division 15 Section "General-Duty Valves for Plumbing Piping."
- B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.

1. Install backwater valves in accessible locations.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports for Plumbing Piping." Install the following:
 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 15 Section "Hangers and Supports for Plumbing Piping."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches with 3/8-inch (10-mm) rod.
 2. NPS 3 (DN 80): 48 inches with 1/2-inch (13-mm) rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches with 5/8-inch (16-mm) rod.
 4. NPS 6 (DN 150): 48 inches with 3/4-inch (19-mm) rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).
- G. Install supports for vertical PVC piping every 48 inches (1200 mm).
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:
 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than

required by plumbing code.

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
 1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 2. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

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SECTION 15155 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
1. Backwater valves.
 2. Cleanouts.
 3. Floor drains.
 4. Roof flashing assemblies.
 5. Miscellaneous sanitary drainage piping specialties.
 6. Flashing materials.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Exposed Cast-Iron Cleanouts:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
 4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
 5. Size: Same as connected drainage piping
 6. Body Material: As required to match connected piping.
 7. Closure: Brass plug.
 8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Oatey.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Tyler Pipe; Wade Div.
 - f. Watts Drainage Products Inc.
 - g. Zurn Plumbing Products Group; Light Commercial Operation.
 - h. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M for adjustable housing cleanout.
5. Size: Same as connected branch.
6. Type: Adjustable housing.
7. Body or Ferrule: Cast iron.
8. Clamping Device: Required.
9. Outlet Connection: Threaded.
10. Closure: Brass plug with straight threads and gasket.
11. Adjustable Housing Material: Cast iron with threads.
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
13. Frame and Cover Shape: Round.
14. Top Loading Classification: Extra Heavy Duty.
15. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.36.2M. Include wall access.
5. Size: Same as connected drainage piping.
6. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: Countersunk plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, flat, chrome-plated brass, or stainless-steel cover plate with screw.
10. Wall Access: Round stainless-steel wall-installation frame and cover.

- D. Cleanouts: Provide in PVC sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 50 feet on 3" and smaller and 75' on 4" and larger on straight runs, and elsewhere as shown. Cleanouts shall be full opening type, completely accessible. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with gasket or gasketed access cover. Catalog numbers from J.R. Smith, MI-FAB and Zurn. Cleanout head shall not extend out past finish wall, except in unfinished spaces.

In tile floors: Zurn ZN1400-SZ1, MI-FAB C1100-5, adjustable, cast-iron body with ABS plug or gasketed access cover and satin finished square adjustable scoriated secured nickel bronze top or stainless-steel top or J. R. Smith 4051, where soft tile occurs provide ZN1400-TX or J. R. Smith 4171 recessed square adjustable secured nickel bronze or stainless-steel top.

In concrete floors: Zurn Z1400, MI-FAB C1100-XR or J. R. Smith 4237, cast iron with round adjustable scoriated cast iron top with non-tilt tractor cover ferrule with ABS plug or gasketed access cover.

In accessible unfinished spaces: Zurn Z1445, MI-FAB C1460 or J. R. Smith 4511S or cast iron with ABS plug as appropriate.

In finished walls: J. R. Smith 4531, MI-FAB C1460-RD or Zurn Z1446 cast iron cleanout tee with countersunk ABS plug and stainless-steel wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide 4402 or MI-FAB C1450-RD extended over from sanitary tee to bring plug within 4 inches.

In terrazzo floors: J. R. Smith 4191, MI-FAB C1100-UR or Zurn ZN1400-Z adjustable cast iron head and ferrule, ABS plug and round adjustable secured nickel bronze or stainless-steel top with 1/2" recess.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Light Commercial Operation.
 - g. Zurn Plumbing Products Group; Specification Drainage Operation.
4. Standard: ASME A112.6.3.
5. Pattern: Area drain.
6. Body Material: Gray iron.
7. Seepage Flange: Required.
8. Anchor Flange: Required.
9. Clamping Device: Required.
10. Outlet: Bottom.
11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
12. Sediment Bucket: As required.

13. Top or Strainer Material: Bronze.
14. Top of Body and Strainer Finish: Rough bronze.
15. Top Shape: Round.
16. Top Loading Classification: Extra Heavy-Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Bronze.
20. Trap Pattern: Deep-seal P-trap.
21. Trap Features: Cleanout and trap-seal primer valve drain connection.

- B. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain to have cast iron P-trap. Provide types as scheduled below.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

Typical Floor Drains: Smith 2005B, MI-FAB1100-C-S or Zurn ZN415-SZ1 two-piece cast iron drains with speedi-set type outlet and adjustable nickel bronze or stainless-steel strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6". Membrane clamp where required. Floor drains shall have tap for trap primer as required by code and deep seal 'P' traps.

Mechanical Room Drains: Smith 2230Y, MI-FAB F1340-TFB-4 or Zurn Z541 two-piece cast iron drain with speedi-set outlet, sediment bucket and cast-iron grate. Membrane clamp as required

Kitchen Area Floor Sinks (FS) J. R. Smith 3151-13-L or Zurn ZN1901-3 with stainless steel or nickel bronze rim, $\frac{3}{4}$ " grate, flashing clamp if required, aluminum dome strainer, acid resistant enameled interior finish, 8" deep.

Dishwasher Floor Sink (FS-DW) J. R. Smith 3200-13-L or Zurn ZN1926-3 with flashing clamp if required, stainless steel or nickel bronze rim, $\frac{3}{4}$ " grate, aluminum dome strainer, acid resistant interior finish, 12" deep.

Trench Drain: WM-1 - Zurn Z812 48" x 12" x 18" – Provide w/lint trap.

2.3 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Acorn Engineering Company; Elmdor/Stoneman Div.
 - b. Thaler Metal Industries Ltd.

- B. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe, with galvanized-steel boot reinforcement and counter-flashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
 - b. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
 2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
 3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.
- B. Fasteners: Metal compatible with material and substrate being fastened.
- C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- D. Solder: ASTM B 32, lead-free alloy.
- E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 15 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- H. Assemble open drain fittings and install with top of hub 1 inch (25 mm) above floor.

- I. Install deep-seal traps on floor drains and condensate waste outlets.
- J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.
- K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- M. Install vent caps on each vent pipe passing through roof.
- N. Install traps on plumbing specialty drain outlets.
- O. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.

- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15183 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

1. Suction Lines for Heat-Pump Applications: 450 psi.
2. Hot-Gas and Liquid Lines: 450 psig.

1.3 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ACR - ASTM B 280, Type K or L.
- B. Wrought-Copper Fittings: ASME B16.22.

- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 - 5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 - 3. Operator: Rising stem and hand wheel.
 - 4. Seat: Nylon.
 - 5. End Connections: Socket, union, or flanged.
 - 6. Working Pressure Rating: 500 psig (3450 kPa).
 - 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- B. Check Valves:
 - 1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 - 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 - 3. Piston: Removable polytetrafluoroethylene seat.
 - 4. Closing Spring: Stainless steel.
 - 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 - 6. End Connections: Socket, union, threaded, or flanged.
 - 7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
 - 8. Working Pressure Rating: 500 psig (3450 kPa).
 - 9. Maximum Operating Temperature: 275 deg F (135 deg C).
- C. Service Valves:
 - 1. Body: Forged brass with brass cap including key end to remove core.
 - 2. Core: Removable ball-type check valve with stainless-steel spring.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Copper spring.
 - 5. Working Pressure Rating: 500 psig (3450 kPa).
- D. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
 - 1. Body and Bonnet: Plated steel.
 - 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Threaded.
 - 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.

6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
 8. Manual operator.
- E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat Disc: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 500 psig.
 6. Maximum Operating Temperature: 240 deg F (116 deg C).
- F. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F (4.4 deg C).
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 700 psig (4820 kPa).
- G. Ball Valve: Mitsubishi Diamondback BV-Series or approved equal.
1. Full port design.
 2. 700 PSIG rated.
 3. R-410A compatible.
 4. Flare connections.
 5. Temperature range: -40°F to +325°F.
 6. Ball valve insulation:
 - a. Insulation: Inner and outer layer polyethylene foam (PEF).
 - b. Covering: Adhesive tape of polyvinyl chloride (PVC).
 - c. Separator: Soft film of polyvinyl chloride (PVC).
- H. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig (3450 kPa).
 5. Maximum Operating Temperature: 275 deg F (135 deg C).
- I. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig (3450 kPa).
 6. Maximum Operating Temperature: 275 deg F (135 deg C).
- J. Moisture/Liquid Indicators:
1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.

3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 microns, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 microns, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

M. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.3 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- C. ASHRAE 34, R-410A.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications from Outdoor Unit

Indoor Unit: Nitrogenized ACR hard drawn copper tube – ASTM B280.

- B. Option for variable refrigerate flow units: Mitsubishi (Diamondback) factory pre-insulated (1/2" Twin Tube) soft copper Type L line sets from Outdoor Heat Pump Unit to Indoor Air Handlers. – ASTM E243
- C. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with soldered joints.
- D. Safety-Relief-Valve Discharge Piping:
 - 1. NPS 1-1/2 and Smaller: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at strainers if they are not an integral part of strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 - 1. Solenoid valves.
 - 2. Thermostatic expansion valves.
 - 3. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction

loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- R. Seal penetrations through fire and smoke barriers.
- S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- U. Seal pipe penetrations through exterior walls.
- V. Identify refrigerant piping and valves according to Division 15 Section "Mechanical

Identification."

- W. Record length of refrigerant piping from indoor to outdoor unit. Provide lengths of refrigerant piping to owner in close out documents.

3.4 PIPE JOINT CONSTRUCTION

- A. Soldered Joints (Soft Copper Type L Refrigeration Coils – ASTM B280: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- B. Brazed Joints (Nitrogenized ACR Hard Drawn Copper – ASTM B280: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BA_g, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."
- B. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
- C. Support multi-floor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Comply with ASME B31.5, Chapter VI.
 - 2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).

4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 15195 - FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Pipes, tubes, and fittings.
 2. Piping specialties.
 3. Piping and tubing joining materials.
 4. Valves.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
1. Piping and Valves: 100 psig (690 kPa) minimum unless otherwise indicated.
 2. Service Regulators: 65 psig (450 kPa) minimum unless otherwise indicated.
- B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is 10.5" W.C. or less.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
- C. Welding certificates.
- D. Field quality-control reports.
- E. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- 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.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint,

- and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. OmegaFlex, Inc.
 - b. Parker Hannifin Corporation; Parflex Division.
 - c. Titeflex.
 - d. Tru-Flex Metal Hose Corp.
 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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: 50 or less.
 4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
 5. Striker Plates: Steel, designed to protect tubing from penetrations.
 6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
 7. Operating-Pressure Rating: 5 psig (34.5 kPa).
- C. PE Pipe: ASTM D 2513, SDR 11.
1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
 2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 3. Anodeless Service-Line Risers: Factory fabricated, and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
 - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
 - c. Aboveground Portion: PE transition fitting.
 - d. Outlet shall be threaded or suitable for welded connection.
 - e. Tracer wire connection.
 - f. Ultraviolet shield.
 - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
 4. Transition Service-Line Risers: Factory fabricated, and leak tested.
 - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - b. Outlet shall be threaded or suitable for welded connection.
 - c. Bridging sleeve over mechanical coupling.

- d. Factory-connected anode.
- e. Tracer wire connection.
- f. Ultraviolet shield.
- g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
 - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
 - 4. Corrugated stainless-steel tubing with polymer coating.
 - 5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
 - 6. End Fittings: Zinc-coated steel.
 - 7. Threaded Ends: Comply with ASME B1.20.1.
 - 8. Maximum Length: 72 inches (1830 mm).
- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
 - 1. Copper-alloy convenience outlet and matching plug connector.
 - 2. Nitrile seals.
 - 3. Hand operated with automatic shutoff when disconnected.
 - 4. For indoor or outdoor applications.
 - 5. Adjustable, retractable restraining cable.
- C. Y-Pattern Strainers:
 - 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
 - 2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller.
 - 3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
 - 4. CWP Rating: 125 psig (862 kPa).
- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.
- E. Lab Table Gas Valves:
 - 1. Lab Turret with 2-90° hose, cocks – T& S brass model BL-4203-0 (Gas) or equal.
 - 2. Lab Turret with 4 hose cocks. T&S brass model BL-4203-04 or equal.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig (862 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

2.5 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
 3. Pressure Plates: Carbon steel.
 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.7 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) 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 (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- A. Comply with 2021 International Gas Code for installation and purging of natural-gas piping.
- B. Install underground, natural-gas piping buried at least 36 inches (900 mm) below finished grade. Comply with requirements in Division 2 Section "Earthwork" for excavating, trenching, and backfilling.
 1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.
- C. Install underground, PE, natural-gas piping according to ASTM D 2774.

- D. Install fittings for changes in direction and branch connections.
- E. Exterior-Wall Pipe Penetrations: Seal penetrations using steel or 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.
- F. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- G. Install pressure gage downstream from each service regulator. Pressure gages are specified in Division 15 Section "Meters and Gages."

3.2 INDOOR PIPING INSTALLATION

- A. Comply with 2021 International Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."
- L. Verify final equipment locations for roughing-in.
- M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm)

long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

- O. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment.
- T. Do not use natural-gas piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage downstream from each line regulator. Pressure gages are specified in Division 15 Section "Meters and Gages."

3.3 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube"

Chapter.

- F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.
- G. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Division 22 Section "Hangers and Supports."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
 - 2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).

3.6 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 15 Section "Mechanical Identification" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to 2015 International Gas Code and authorities having jurisdiction.

- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be the following:
 - 1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
- B. Aboveground natural-gas piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.10 INDOOR PIPING SCHEDULE

- A. Aboveground, piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Underground, below building, piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.11 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe shall be the following:
 - 1. Bronze plug valve.

END OF SECTION

(See Attachment "A")

SECTION 15195A - ATTACHMENT "A"

New Gymnasium at Appalachian School
for the Blount County Board of Education
Appalachian, Alabama

ATTACHMENT "A"

1 of 1

MCKEE PROJECT NO. 24.169

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TracPipe® CounterStrike® Flexible Gas Piping Specification Sheet

SPECIFICATION DATE:
PROJECT NAME:
MODEL NUMBERS: FGP-CS-375 - FGP-CS-500 - FGP-CS-750 - FGP-CS-1000 - FGP-CS-1250 - FGP-CS-1500 - FGP-CS-2000
A. Standards & Certifications: All flexible gas piping system components must be:
<p>A.1 CSA International Certified Corrugated Stainless Steel Tubing (CSST) Flexible Gas Piping with Mechanical Attachment AutoFlare® Fittings that conform to the latest ANSI standards for safe performance ANSI LC-1 /CSA 6.26.</p> <p>A.2 Underwriters Laboratories Classification Listed for Thru Penetration Fire Stop Requirements Ratings to include one, two, three and four hour tests.</p> <p>A.3 Listed with FM (Factory Mutual) requirements for Flammable Gas Piping Systems. For seismic resistance.</p> <p>A.4 Tubing shall be tested and listed in accordance with ICC LC-1024. For resistance to arcing from transient energy.</p>
B. Stainless Steel Tubing:
<p>B.1 Tubing shall be made from 300 series Stainless Steel Strip conforming to ASTM A240.</p> <p>B.2 Tubing shall not be subjected to heat treating or annealing after the corrugation forming operation.</p> <p>B.3 Tubing shall be suitable for operation with fuel gases.</p> <p>B.4 Tubing is rated for 25-PSI.</p> <p>B.5 Tubing must have elevated pressure ratings of 125G for sizes up to 1-1/4 inches for high-pressure applications permitted by the Local Distribution Utility. These elevated pressure ratings shall be demonstrated by test reports from the certification agency.</p>
C. Plastic Jacket:
<p>C.1 The jacket shall be extruded from fire-retarded Polyethylene.</p> <p>C.2 Chlorinated plastics such as PVC are not permitted.</p> <p>C.3 ASTM E-84 flame spread rating shall not exceed 25.</p> <p>C.4 ASTM E-84 smoke density rating shall not exceed 50.</p> <p>C.5 Polyethylene is to be resistant to UV.</p> <p>C.6 Jacket shall be a single layer black and electrically conductive.</p>
D. AutoFlare® Mechanical Attachment Fittings:
<p>D.1 Fittings shall be made from yellow brass.</p> <p>D.2 Fittings shall be equipped with a stainless steel insert to pilot on the tubing ID and provide a reliable flaring operation.</p> <p>D.3 Fittings are tested and listed by CSA International for concealed use where required.</p> <p>D.4 Fittings are available in straight, straight reducer, tee, reducer tee and coupling configurations.</p> <p>D.5 Fittings shall provide a metal-to-metal seal (no gaskets).</p>
E. Protective Devices:
<p>E.1 Striker Plates:</p> <p>E.1 A Striker plates shall be listed as part of the OMEGAFLEX, INC. TracPipe® system and shall be marked with the symbol of the Manufacturer (OMEGAFLEX, INC.) and the listing Agency (CSA International).</p> <p>E. 1 B Striker plates shall be made from carbon steel, heat-treated to RB75.</p> <p>E. 1 C Striker Plates are available in Quarter, Half, Three Quarter, Full and 6 X 17 Configurations.</p> <p>E.2 Floppy Conduit:</p> <p>E.2 A Floppy conduit used for additional protection with striker plates (type RW electrical conduit) is to be made from galvanized steel.</p>
F. Accessories:
<p>F.1 Termination Mount Fittings are to be used to provide a secure termination for the tubing at moveable appliance locations and other "stub-out" points depending on building construction. Termination mount accessories consist of a plated carbon steel plate or brass mounting flange and an AutoFlare® fitting. Fittings at termination mounts must be accessible and provide a fitting joint exterior to the building floor or wall.</p>

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TracPipe® CounterStrike® Flexible Gas Piping Specification Sheet

Continued

F. Accessories: Continued

F.2 Meter Termination Fittings may be used for exterior wall penetrations at meter locations and other penetrations such as roof top units. Meter terminations consist of a plated carbon steel mounting plate and sleeve and an **AutoFlare** fitting. Fittings at meter termination outlets must be accessible and provide a fitting joint exterior to the building.

F.3 Manifolds are made from malleable iron either poly coated or uncoated. Manifolds may be mounted using available manifold brackets or Gas Load Centers; they may alternatively be mounted using conventional pipe mounting methods.

F.4 Pounds-to-inches line pressure regulators shall be listed per ANSI Z21.80 or a recognized national standard for pressure regulators. Regulators must be mounted in an accessible location.

F.4.1 Regulators with included approved vent-limiting device do not require venting to outdoors provided they are mounted in a ventilated location (e.g. near a gas appliance which also requires placement in a ventilated area). Ventilated locations include (but are not limited to) mechanical rooms, attics, garages, and basements.

F.4.2 Approved vent limiters limit the fuel gas leakage to 2.5 cfh in the event of a diaphragm failure.

F.5 Shut-off valves must be approved for fuel gas service and must be rated for the pressure of the gas piping system installed. For elevated pressure sections an approved valve must be located upstream from the pounds-to-inches regulator.

F.6 Overpressure protection devices must be installed for elevated systems higher than 2-PSI to prevent downstream pressure from exceeding 2-PSI in the event of regulator failure.

G. Bonding:

G.1 Primary protection from nearby lightning strikes for all metallic systems within a building is recommended to be provided by proper grounding of the electrical system and equipotential bonding of all metallic systems including the gas piping system. Grounding and bonding shall be in accordance with the National Electrical Code NFPA 70.

G.2 The installation of a lightning protection system per NFPA 780 is recommended in areas prone to a high level of lightning strikes to protect the building in the event of a direct strike.

G.3. There are no additional bonding requirements for **CounterStrike**® imposed by the manufacturer's installation instructions. The piping system is to be bonded in accordance with the National Electrical Code NFPA 70 Article 250.104, and any local requirements which may be in excess of the manufacturers requirements.

G.4. Wherever possible, tubing runs should be installed with a bend radius of 8 inches or more.

G.5 Where required by the AHD the bonding clamp must be attached to the brass **AutoFlare**® fitting adapter (adjacent to the pipe thread area –see illustration below) or to a black pipe component (pipe or fitting) located in the same electrically continuous gas piping system. The corrugated stainless steel portion of the gas piping system **SHALL NOT** be used as the bonding attachment point under any circumstances.

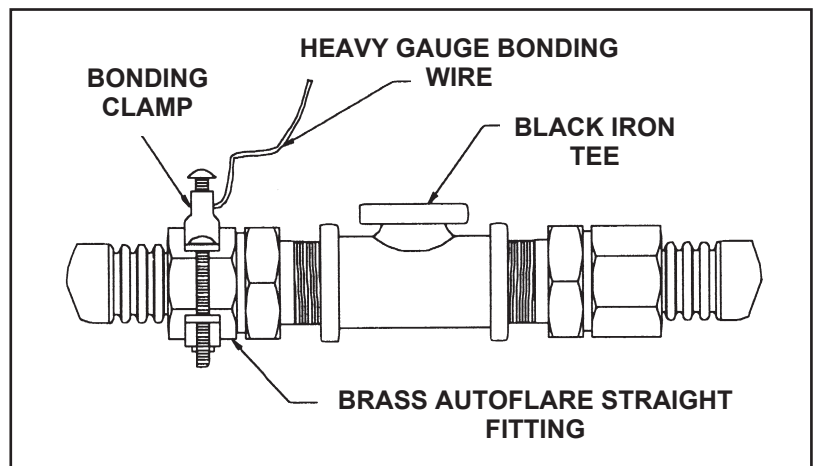


Diagram is for illustration purposes only.
Bonding wire attachment when required by local code.

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TracPipe[®] PS-II Underground Specification Sheet

SPECIFICATION DATE:							
PROJECT NAME:							
MODEL NUMBERS: FGP-UGP-375 - FGP-UGP-500 - FGP-UGP-750 - FGP-UGP-1000 - FGP-UGP-1250 - FGP-UGP-1500 - FGP-UGP-2000							
<p>A.1 CSST underground and under building slab installations shall be made using the pre-sleeved TracPipe PS-II system or other sleeve configurations meeting code requirements and acceptable to the local administrative authority.</p> <p>A.2 Underground piping shall consist of CSST sleeved with a black integral polyethylene sleeve. The external polyethylene sleeve shall be designed to withstand the superimposed loads. The external protective sleeve shall have internal vent channels lengthwise to direct any leakage along the pipe to the end fittings.</p> <p>A.3 For gas piping under building slabs, Plumbing, Mechanical and Fuel Gas Code requirements shall be followed for encasement within a conduit and venting to the atmosphere. The construction of the pre-sleeved system shall provide the encasement and venting capabilities required by the codes.</p> <p>A.4 Underground fittings may be used within the system. All metallic parts of the buried fittings shall be wrapped in a code-approved manner (e.g. mastic used for wrapping metallic pipe). Underground fittings are not permitted under the slab of a building.</p> <p>A.5 The underground piping system shall be listed by either ICC or IAPMO for use in underground or underground beneath building applications.</p>							
Superimposed Loading Chart							
TracPipe PS-II Size	3/8 inch	1/2 inch	3/4 inch	1 inch	1- 1/4 inch	1-1/2 inch	2 inch
Max. Superimposed Loading <i>psf</i>	9640	7254	5409	4203	3390	2901	2124
<small>NOTES: 1. Super-imposed loading includes all dead load and live load combinations. 2. Maximum buried depth of 36 inches. 3. Soil Density: 120 PCF. 4. Factor of safety used: 4.</small>							
B. Stainless Steel Tubing:							
<p>B.1 Tubing shall be made from 300 series Stainless Steel Strip conforming to ASTM A240.</p> <p>B.2 Tubing shall not be subjected to heat treating or annealing after the corrugation forming operation.</p> <p>B.3 Tubing shall be suitable for operation with fuel gases.</p> <p>B.4 Tubing is rated for 25-PSI.</p> <p>B.5 Tubing must have elevated pressure ratings of 125G for sizes up to 1-1/4 inches for high-pressure applications permitted by the Local Distribution Utility. These elevated pressure ratings shall be demonstrated by test reports from the certification agency.</p>							
C. AutoFlare[®] Mechanical Attachment Fittings:							
<p>C.1 Fittings shall be made from yellow brass.</p> <p>C.2 Fittings shall be equipped with a stainless steel insert to pilot on the tubing ID and provide a reliable flaring operation.</p> <p>C.3 Fittings are tested and listed by CSA International for concealed use.</p> <p>C.4 Fittings are available in straight, straight reducer, tee, reducer tee and coupling configurations.</p> <p>C.5 Fittings shall provide a metal-to-metal seal (no gaskets).</p> <p>C.6 Fittings shall be supplied with a plastic containment coupling and 1/4 inch NPT vent port, to provide venting as required.</p>							
D. Bonding:							
<p>D.1 There are no additional bonding requirements for TracPipe[®] Ps-II imposed by the manufacturer's installation instructions. The piping system is to be bonded in accordance with the National Electrical Code NFPA 70 Article 250.104, and any local requirements which may be in excess of the manufacturers requirements.</p> <p>D.2 Tubing runs shall be installed with a bend radius not exceeding those established by the manufacturer.</p> <p>D.3 Where required by the AHD the bonding clamp must be attached to the brass AutoFlare[®] fitting adapter (adjacent to the pipe thread area –see illustration below) or to a black pipe component (pipe or fitting) located in the same electrically continuous gas piping system. The corrugated stainless steel portion of the gas piping system SHALL NOT be used as the bonding attachment point under any circumstances.</p>							

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TracPipe® PS-II Underground Specification Sheet

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D. Bonding: (cont)

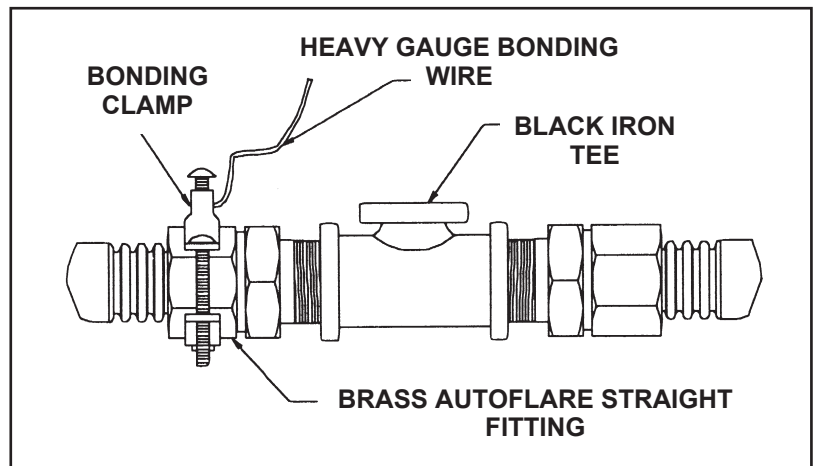


Diagram is for illustration purposes only.
Bonding wire attachment when required by local code.

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SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plumbing fixtures.

1.2 SUBMITTALS

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

1.3 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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities "Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 3. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 4. Stainless-Steel Residential Sinks: ASME A112.19.3.
 5. Vitreous-China Fixtures: ASME A112.19.2M.
 6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
- G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 4. Faucets: ASME A112.18.1.
 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 8. NSF Potable-Water Materials: NSF 61.
 9. Pipe Threads: ASME B1.20.1.

10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Supply Fittings: ASME A112.18.1.
 12. Brass Waste Fittings: ASME A112.18.2.
- H. Comply with the following applicable standards and other requirements specified for shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Manual-Control Antiscald Faucets: ASTM F 444.
 8. Pipe Threads: ASME B1.20.1.
 9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Dishwasher Air-Gap Fittings: ASSE 1021.
 4. Manual-Operation Flushometers: ASSE 1037.
 5. Plastic Tubular Fittings: ASTM F 409.
 6. Brass Waste Fittings: ASME A112.18.2.
 7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Dishwasher Air-Gap Fittings: ASSE 1021.
 3. Flexible Water Connectors: ASME A112.18.6.
 4. Grab Bars: ASTM F 446.
 5. Hose-Coupling Threads: ASME B1.20.7.
 6. Off-Floor Fixture Supports: ASME A112.6.1M.
 7. Pipe Threads: ASME B1.20.1.
 8. Plastic Toilet Seats: ANSI Z124.5.
 9. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 FIXTURES AND MISCELLANEOUS ITEMS

- A. Fixture Trim: Exposed metal parts to be of heavy weight polished brass, heavily chromium plates, of best quality as regularly furnished by the plumbing fixture manufacturer. Supplies to all fixtures and equipment shall be provided with stop valves.

B. Scheduled Items:

WC-1 ADA FLOOR MOUNTED FLUSH VALVE

ZURN Z5665-BWL-1 (1.6 gpf) ADA height floor mount top spud flush valve toilet; Z6200 (HET) YB YC YK piston-operated manual flush. Provide Bemis 1955 SS CT white seat with Sta-Tight fastening system, closet bolt/wax ring kit. No carrier required. Equal by Kohler, American Standard or Toto. Flush valve equal to Toto or Sloan Crown.

WC-2 FLOOR MOUNTED REGULAR HEIGHT FLUSH VALVE

ZURN Z5655-BWL-1 (1.6 gpf) floor mount top spud flush valve toilet, Z6200 (HET) YB YC YK piston-operated manual flush valve. Provide Bemis 1955 SS CT white seat with Sta-Tight fastening system, closet bolt/wax ring kit. No carrier required. Equal by Kohler, American Standard or Toto. Flush valve equal to Toto or Sloan Crown.

UR-1 ADA

ZURN: Z5755U (1.0) top spud siphon jet urinal; with vandal resistant flat strainer, Z6203 YB YC YK (WS 1.0) manual piston flush valve. Furnish Zurn Z1222 urinal carrier or equal by J. R. Smith. Mount 17" lip to finished floor. Equal By: American Standard, Kohler, and Toto. Flush valve equal to Toto or Sloan Crown.

UR-2 STANDARD

ZURN: Z5755U (1.0) top spud siphon jet urinal; with vandal resistant flat strainer, Z6203 YB YC YK (WS 1.0) manual piston flush valve. Furnish Zurn Z1222 urinal carrier or equal by J. R. Smith. Equal By: American Standard, Kohler, and Toto. Flush valve equal to Toto or Sloan Crown.

L-1 LAVATORY WALL HUNG ADA

ZURN Z831R1-XL-3M 20 X 18" wall hung concealed arm lavatory with Z831R1-XL-3M manual lavatory faucet with 2.5" lever handles. Z8746-PC off set grid drain, Z8700PC cast 1 1/4" p-trap, ZH8824 XL PC heavy duty stops with Z8860-XL-12-SS stainless braided supplies and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Furnish Zurn Z1231EZ concealed lavatory carrier or equal by J. R. Smith. Equal units by Kohler, American Standard, Toto, T & S and McGuire. Mount 34" rim to finished floor.

L-2 LAVATORY

ZURN Z831R1-XL-3M 20" x 18" wall hung concealed arm lavatory with Z831R1-XL-3M manual lavatory faucet with 2.5" lever handles. Z8746-PC off set grid drain, Z8700PC cast 1 1/4" p- trap, ZH8824 XL PC heavy duty stops with Z8860-XL-12-SS stainless braided supplies and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Furnish Zurn Z1231EZ concealed lavatory carrier or equal by J.R. Smith. Equal units by Kohler, American Standard, Toto, T & S and McGuire.

MB-1 MOP SINK

Zurn Z5850-DS cast iron custodial floor mounted floor sink with 3" Drain. Provide Z5850-RG rim guard, Zurn Z843M1-RC service sink faucet, JP 1996-24 wall guard, JP1996 HH hose and bracket and JP1996MH mop hanger, Equal units by Central Brass, American Standard, Toto, or T & S

EWC-1 ELECTRIC WATER COOLER

Elkay LZSTL8WSSK bottle station. Furnish LKAPREZL cane apron as required. Comparable products by Haws 1212SF Bottle Station SK6 Cane Apron & Oasis. Trap supplies with stops: Zurn or Kohler. Mount 36" spout to finished floor. Finish to be stainless steel. Provide Flex Guard Safety Bubbler.Z1225-BL bi-level lavatory carrier or equal by J.R. Smith or MiFab.

SH-1: SHOWER (H/C)

Temperature and Pressure Balanced mixing valve: Powers E 700-T/P or equivalent by American Standard, Zurn, Symmons, Lawler, and Leonard; Provide stop and check valves and solid brass chrome lever handle, furnish adjustable spray handheld shower with 59" long metal hose, Handheld shall meet ADA. Provide handheld with on/off control with a non-positive shut-off. 24" adjustable slide bar. Inline vacuum breaker. Provide fold down seat. 36" x 36" ADA transfer shower. Left or right valve wall. Freedom model APFQ3682BF75 L or R approved equal.

WM-1: WASHING MACHINE BOX

Provide (2) ¾" hose bibb connections for HW/CW. Provide 48"x18"x12" Deep Trench drain with slope from end to center. Fibreglas troughs drain with steel grate. Zurn Model Z812 or equal by J.R. Smith or Wade. Provide with catch basin and wire basket or lint interceptor. Provide with trap guard. Provide 3" SCH. 40 PVC from washer.

WM-2: WASHING MACHING BOX

Provide (2) ¾" hose bibb connections for HW/CW. Provide 48"x18"x12" Deep Trench drain with slope from end to center. Fibreglas troughs drain with steel grate. Zurn Model Z812 or equal by J.R. Smith or Wade. Provide with catch basin and wire basket or lint interceptor. Provide with trap guard. Provide 3" SCH. 40 PVC from washer.

HS-1:

ZURN Z5348 20 X 18" wall hung concealed arm lavatory with Z831R4-XL-3M manual lavatory faucet with wing handles. Z8746-PC off set grid drain, Z8700PC cast 1 ¼" p-trap, ZH8824 XL PC heavy duty stops with Z8860-XL-12-SS stainless braided supplies and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Furnish Zurn Z1231EZ concealed lavatory carrier or equal by J. R. Smith. Equal units by Kohler, American Standard, Toto, T & S and McGuire. Mount 34" rim to finished floor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- L. Install toilet seats on water closets.
- M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- P. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- Q. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- R. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by the Contracting Officer.

END OF SECTION

SECTION 15485 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Household, storage electric water heaters.
 - 2. Light-commercial electric water heaters.
 - 3. Commercial electric booster heaters.
 - 4. Commercial, storage electric water heaters.
 - 5. Water heater accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

1.3 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. ASHRAE/IESNA-90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.

- c. Deterioration of metals, metal finishes, and other materials beyond normal use.
- 2. Warranty Period(s): From date of Substantial Completion:
 - a. Commercial Electric Water Heaters: Three years.

PART 2 - PRODUCTS

2.1 WATER HEATERS

- A. Water Heater (WH-1): Electric water heater 30-gallon storage capacity, recovery capacity 24 GPH at 100-degree rise, 6 KW heating element for 208/1/60 cycle current; A.O. Smith Model ELDS 30-TB. Comparable products by: Rudd, Rheem, State or Hubbell.
- B. Temperature Limiting Valve Model ZW3870XLT for all lavatories, sinks, etc., or equivalent by Watts, Acorn, Wilkins, Powers, Symmons, or T & S..
- C. Relief Valves: Install (in accordance with USA Standard 221.22) properly sized AGA and ASME approved T&P relief valves with copper overflow lines to floor drain as indicated
- D. Safety Pan: Minimum of 1-1/2" deep X diameter of water heater plus 3" galvanized steel with a minimum of 1" drain.
- E. Thermal Expansion Tank: Zurn Wilkins min. cap 2.1 gallons.
- F. Provide braided copper bonding jumper between cold and hot water lines for grounding purposes.
- G. Circulating Pump: Pump shall be Grundfos Alpha 15-55F all bronze pump with 1/20 HP motor, 120V, 1 PH with built-in overload protection. Pump shall have a capacity of 7 GPM at 10-foot head. Comparable products by: Bell & Gossett, Paco.
- H. Provide Time Clock (seven-day) for pump control 120/1/60 operating hours, 6:00 A.M. - 5:00 P.M. Monday through Friday. Verify with owner for weekend operation. Tork Model T171.
- I. A nominal water containing capacity of 5 gallons if located in building owned by or under the control of the state, county, municipality, separate school district or other public entity.

These units are required to be registered with the state. They receive a biennial inspection and certificate of operation. They are not required to have an installation permit or have ASME/NB stamping.

2.2 WATER HEATER ACCESSORIES

- A. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.
- B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to

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- E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- (172.5-kPa-) maximum outlet pressure, unless otherwise indicated.
- F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
 - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.
- E. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages for Plumbing Piping" for thermometers. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.
- F. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- G. Fill water heaters with water.

3.2 CONNECTIONS

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

3.3 FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.
- B. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 15486 – GAS WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY:

- A. This Section includes the following:
 - 1. Light-commercial gas water heaters.
 - 2. Commercial, storage gas water heaters.
 - 3. Water heater accessories.

1.2 SUBMITTALS:

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.
- D. Warranty.

1.3 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. ASHRAE/IESNA-90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY:

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period(s): From date of Substantial Completion:
 - a. Commercial Gas Heaters: Three years.

PART 2 - PRODUCTS

2.1 WATER HEATERS:

- A. Water Heater (WH-2): 119-gallon, natural gas-fired glass-lined storage water heaters, A.O. Smith BTH-199, Natural gas condensing water heater; capacity not less than 300,000 BTU per hour, and recovery capacity not less than 440 GPH first hour and not less than 349 GPH recovery at 100 degrees F. temperature rise. Comparable products by A.O. Smith, Lochinvar, Rheem or Rudd, each with three-year limited tank warranty.
- B. Temperature Limiting Valve: ZURN ZW3870XLT for all lavatories, sinks, etc., or equivalent by Watts, Powers, Symmons or T & S.
- C. Relief Valves: Install (in accordance with USA Standard 221.22) properly sized AGA and ASME approved T&P relief valves with copper overflow lines to floor drain as indicated.
- D. Safety Pan: Minimum of 1-1/2" deep X diameter of water heater plus 3" galvanized steel with a minimum of 1" drain.
- E. Vents: 4" IPEX System 636 Flue Gas Venting or equal. Complete with JR Smith wall cap, storm collar, elbows, tees, ceiling collars, etc., as required for complete NFPA approved manufacturer. Vent pipes must be securely attached to each vented appliance and be supported at points where they pass through wall. Lateral runs must be supported at 5-foot intervals. Vent (lower opening of cap) shall extend 3' above outdoor air hood.
- F. Provide factory fabricated concentric termination wall kit for each set of intake and vent pipes. Install as per factory recommendations.
- G. Thermal Expansion Tank: Zurn Wilkins min. cap. 4.5 gallons.
- H. Provide braided copper bonding jumper between cold and hot water lines for grounding purposes.
- I. The state requires a permit and inspection for all gas fired boilers and water heaters. All boilers and water heaters exceeding 200,000 BTUH and 120-gallon storage must meet A.S.M.E. requirements. Plumber is responsible for the permits and cost as required.
- J. Circulating Pump Circulating Pump: Pump shall be Grundfos Alpha 15-55HWR-SU/T all bronze pump with 1/20 HP motor, 120V, 1 PH with built-in overload protection. Pump shall have a capacity of 9 GPM at 10-foot head. Comparable products by: Bell & Gossett, Paco.
- H. Provide Time Clock (seven-day) for pump control 120/1/60 operating hours, 6:00 A.M. - 5:00 P.M. Monday through Friday. Verify with owner for weekend operation. Tork Model T171.
- I. A nominal water containing capacity of 5 gallons if located in building owned by or under the control of the state, county, municipality, separate school district or other public entity.

These units are required to be registered with the state. They receive a biennial inspection and certificate of operation. They are not required to have an installation permit or have ASME/NB stamping.

2.2 WATER HEATER ACCESSORIES:

- A. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.
- B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.
- C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).
- D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004.
- E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- (172.5-kPa-) maximum outlet pressure, unless otherwise indicated.
- F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION:

- A. Install commercial water heaters on concrete bases.
 - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
 - 2. Concrete base construction requirements are specified in Division 15.
- B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for hose-end drain valves.
- E. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.
- F. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.
- G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- H. Fill water heaters with water.

3.2 CONNECTIONS:

- A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

3.3 FIELD QUALITY CONTROL:

- A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.
- B. Perform the following field tests and inspections:
 - 1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION:

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

SECTION 15700 - DUCTLESS HEAT PUMP INDOOR AND OUTDOOR SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Indoor and outdoor heat pump mini-split units.

1.3 SUBMITTALS

- A. Product Data: For each piece of equipment indicated.
 - 1. Unit dimensions and weight.
 - 2. Cabinet material, metal thickness, finishes, insulation, and accessories.
 - 3. Fans:
 - a. Certified fan-performance curves with system operating conditions indicated.
 - b. Certified fan-sound power ratings.
 - c. Fan construction and accessories.
 - d. Motor ratings, electrical characteristics, and motor accessories.
 - 4. Certified coil-performance ratings with system operating conditions indicated.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Filters with performance characteristics.
 - 7. Compressor.
- B. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
 - 2. Support location, type, and weight.
 - 3. Field measurements.

C. Source quality-control reports.

D. Field quality-control reports.

E. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430 and shall be listed and labeled by ARI.

- D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- E. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate location of all equipment with structural, lighting and all trades prior to installation.

1.6 SYSTEM DESCRIPTION

- A. The heat pump mini-split system shall be by Mitsubishi. Equal by LG, Samsung, Trane, and Fujitsu
- B. The heat pump system shall consist of the outdoor unit, indoor units, and DDC controls (Direct Digital Controls). System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. System shall be capable of controlling associated exhaust fans via occupied/unoccupied schedule.

1.7 QUALITY ASSURANCE

- A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
- E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendation.

1.9 CONTROLS

- A. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications.
- B. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
- C. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

PART 2 - WARRANTY

2.1 Parts and Labor warranty for a period of one (2) year from date of installation.

- 1. The systems shall be:
 - a) Installed by a contractor that has successfully completed the Mitsubishi one day service course.
 - b) A completed commissioning report submitted to and approved by the Mitsubishi.

2. The compressor shall have a manufacturer's parts and labor warranty for a period of seven (7) years from date of installation.
3. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired by the manufacturer.

2.2 All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

PART 3 – PRODUCTS

3.1 MANUFACTURERS

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Mitsubishi.
2. LG.
3. Trane.
4. Fujitsu

3.2 HEAT PUMP OUTDOOR UNIT

A. General:

The outdoor units shall be equipped with multiple circuit boards that interface to the controls system and shall perform all functions necessary for operation. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit shall be run tested at the factory.

1. Outdoor unit shall have a sound rating no higher than 59 dB(A).
2. Both refrigerant lines from the outdoor unit to indoor units shall be individually insulated.
3. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
4. The outdoor unit shall have a high-pressure safety switch, low pressure safety switch and over-current protection and DC bus protection.
5. The outdoor unit shall be capable of cooling operation down to 23°F outdoor ambient without additional low ambient controls.
6. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

B. Unit Cabinet:

1. The casing shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:

1. The unit shall be furnished with two direct drive, variable speed motors.
2. The fans will be forward curved type blades for quiet operation.
3. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
4. The fan motor shall be mounted for quiet operation.
5. The fan shall be provided with a raised guard to prevent contact with moving parts.

6. The outdoor unit shall have horizontal discharge airflow.
- D. Refrigerant
1. R410A refrigerant shall be required for all outdoor unit systems.
- E. Coil:
1. The outdoor coil shall be of nonferrous construction with lanced or corrugated fins on copper tubing.
 2. The coil fins will have a factory applied corrosion resistant blue-fin finish.
 3. The coil shall be protected with an integral metal guard.
 4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
- F. Compressor:
1. The compressor shall be a single high performance, inverter driven, modulating capacity scroll compressor.
 2. The outdoor unit compressor shall have an inverter to modulate capacity. The compressor shall be equipped with an internal thermal overload.
 3. The compressor shall be mounted to avoid the transmission of vibration.
- G. Electrical:
1. The outdoor unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 2. The unit shall be capable of satisfactory operation within voltage limitations of 187-228 volts (208V/60Hz)
 3. The outdoor unit shall be controlled by integral microprocessors.

3.3 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE, INDOOR UNIT (34" X 34")

- A. General
1. The indoor cassette shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
- B. Unit Cabinet:
1. The cabinet shall be space-saving ceiling-recessed cassette.
 2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
 3. Branch ducting shall be allowed from cabinet.
 4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
 5. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space
- C. Fan:
1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 3. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
 4. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set point and space temperature.
 5. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
 6. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.
 7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
- D. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.
- E. Return air shall be filtered by means of a long-life washable filter.
- F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 2. The tubing shall have inner grooves for high efficiency heat exchange.
 3. All tube joints shall be brazed with phos-copper or silver alloy.
 4. The coils shall be pressure tested at the factory.
 5. A condensate pan and drain shall be provided under the coil.
 6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.
 7. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.
- G. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).
- H. Controls:
1. This unit shall use controls provided by unit manufacturer to perform functions necessary to operate the system.
 2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

PART 4 - CONTROLS

4.1 OVERVIEW

A. General:

All indoor units shall have wall mounted programmable controller with lockable cover.

PART 5 - EXECUTION

5.1 INSTALLATION

- A. General:
Rig and install in full accordance with manufacturer's requirements, project drawings, and contract documents. Refer to the manufacturer's installation manual for full requirements.
- B. Location:
Locate indoor and outdoor units as indicated on drawings. Coordinate with lighting, structural and all trades prior to installation. Notify architect immediately of any conflicts or issues. Provide service clearance per manufacturer's installation manual. Adjust and level outdoor units on support structure.
- C. Components / Piping:
Installing contractor shall provide and install all accessories and piping for a fully operational system. Refer to manufacturer's installation manual for full instructions.

Traps, filter driers, and sight glasses are NOT to be installed on the refrigerant piping or condensate lines.

Standard ACR fittings rated for use with R410A are to be used for all connections. Proprietary manufacturer-specific appurtenances are not allowed.

Refrigerant pipe for shall be made of phosphorus deoxidized copper and has two types.

A. ACR "Annealed": Soft copper pipe, can be easily bent with human's hand.

B. ACR "Drawn Temper": Hard copper pipe (Straight pipe), being stronger than Type-O pipe of the same radical thickness.

The maximum operation pressure of R410A air conditioner is 4.30 MPa [623psi]. The refrigerant piping should ensure the safety under the maximum operation pressure. Refer to manufacturer recommend piping specifications. Pipes of radical thickness 0.7mm or less shall not be used.

Flare connection should follow dimensions provided in manufacturer's installation manuals.

- D. Insulation:
See specification section 15088 HVAC Piping Insulation.
- E. Electrical:
Installing contractor shall coordinate electrical requirements and connections for all power feeds with electrical contractor.

END OF SECTION

SECTION 15735 - PACKAGE ROOFTOP AC UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes packaged, outdoor, rooftop units with the following components and accessories:
 - 1. Packaged Rooftop Units

1.3 PERFORMANCE REQUIREMENTS

- A. Wind-Restraint Performance:
 - 1. Basic Wind Speed: 90 mph.
 - 2. Minimum 10 lb/sq. ft (48.8 kg/sq. m) multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each packaged unit, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which packaged units will be attached.
 - 2. Roof openings
 - 3. Roof curbs and flashing.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For packaged units to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. ARI Compliance:
 - 1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for packaged units.
 - 2. Comply with ARI 270 for testing and rating sound performance for packaged units.
- B. UL Compliance: Comply with UL 1995.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of packaged units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
 - 2. Warranty Period for Control Boards: Manufacturer's standard, but not less than five years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan Belts: 2 sets for each belt-driven fan.
 - 2. Filters: 4 sets of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Trane.
 - 2. Lennox.
 - 3. Carrier.

2.2 PACKAGE UNIT

- A. General: The units shall be convertible airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for units with microprocessor controls. Operating range for units with electromechanical controls shall be between 115°F and 40°F. Cooling performance shall be rated in accordance with ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-454B, and 100% run tested to check cooling operation, fan and blow rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be UL listed and labeled, classified in accordance for Central Cooling Air Conditioners.
- B. Casing: Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing two fasteners while providing a water and airtight seal. All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material. The base of the unit shall be insulated with 1/8", foil-faced, closed-cell insulation. All insulation edges shall be either captured or sealed. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1-1/8" high downflow supply/return openings to provide an added water integrity precaution if the condensate drain backs up. The base of the unit shall have provisions for forklift and crane lifting, with forklift capacities on three sides of the unit.
- C. Powered Convenience Outlet: This is a GFCI, 120V/15-amp, 2 plug, ground-fault protected powered convenience outlet. When the convenience outlet is powered, a service receptacle disconnect will be available. The convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker. This option can only be ordered when the "Through the Base Electrical with either the Disconnect Switch or Circuit Breaker" option is ordered.
- D. Unit Top: The top cover shall be one-piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top.
- E. Filters: Throw away filters shall be standard on all units. 2" MERV 8 filters.
- F. Compressors: All units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10% of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors.
- G. Crankcase heaters shall be included.
- H. Evaporator and Condenser Coils: Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. The microchannel type of condenser coil is standard for the 10-ton models and 7.5-ton models. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 600 psig. The assembled unit shall be leak tested to 465 psig. A removable, reversible, double-sloped condensate drain pan with through the base condensate drain shall be provided.

- I. Outdoor Fans: The outdoor fan shall be direct-drive, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motor shall be permanently lubricated and shall have built-in thermal overload protection.
- J. Plenum Fan: The following unit shall be equipped with a direct drive plenum fan design. Plenum fan design shall include a backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor. All plenum fan designs will have a variable speed adjustment potentiometer located in the control box.
- K. Controls: Unit shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Unit shall provide an external location for mounting a fused disconnect device. A choice of microprocessor or electromechanical controls shall be available. Microprocessor controls provide for volt control functions. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.
- L. Refrigerant Circuits: Each refrigerant circuit offers thermal expansion valves as standard. Service pressure ports and refrigerant line filter driers are factory installed as standard. An area shall be provided for replacement suction line driers.
- M. Phase Monitor: Phase monitor shall provide 100% protection for motors and compressors against problems caused by phase loss, phase imbalance and phase reversal. Phase monitor is equipped with an LED that provides an ON or FAULT indicator. There are no field adjustments. The module will automatically reset from a fault condition.
- N. Electric Heaters: Provide electric heat modules for unit. Electric heater elements shall be constructed of heavy-duty nickel chromium elements internally. Provide SCR heater. Each heater package shall have automatically reset high limit control operating through heating element contactors. All heaters shall be individually fused from the factory, where required, and shall meet all NEC and CEC requirements when properly installed. Power assemblies shall provide single point connection. Electric heat modules shall be UL listed or CSA certified.
- O. Provide disconnect switch. Three-pole, molded case, disconnect switch shall be provided. The disconnect switch shall be installed in the unit in a watertight enclosure with access through a swinging door. Wiring will be provided from the switch to the unit high voltage terminal block. The switch will be UL/CSA certified.

Note: The disconnect switch will be sized per NEC and UL guidelines but will not be used in place of unit overcurrent protection.
- P. Accessory-Tool-Less Hail Guards: Tool-less, hail protection quality coil guards shall be provided for condenser coil protection.
- Q. Outside Air Intake Hood and Barometric Relief Hood: Outside air hood and barometric relief hood shall be provided. The assembly shall include motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and fixed dry bulb control. The barometric relief shall provide a motor operated damper that shall close and shall prohibit entrance of outside air during the equipment off cycle.
- R. Roof Curb: The roof curb (14" tall) shall be designed to mate with the unit's downflow supply and return and provide support and a watertight installation when installed properly. The roof curb design shall allow field fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements. Curb shall be shipped knocked down for field assembly and shall include wood nailer strips.

2.3 ACCESSORIES

- A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.
- B. Low-ambient kit using staged condenser fans for operation down to 35 deg F (1.7 deg C).
- C. Hail coil guards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of package unit.
- B. Examine roughing-in for package unit to verify actual locations of piping and duct connections before equipment installation.
- C. Examine grade for suitable conditions where package unit will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Install piping adjacent to package unit to allow service and maintenance.
- C. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at top of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to package unit with flexible duct connectors specified in Division 15 Section "Duct Accessories."
 - 4. Install return-air duct continuously through roof structure.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing. Retain paragraph below to require Contractor to perform tests and inspections.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
- C. Tests and Inspections:

1. After installing package unit and after electrical circuitry has been energized, test units for compliance with requirements.
 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup check according to manufacturer's written instructions and do the following:
1. Inspect for visible damage to unit casing.
 2. Inspect for visible damage to furnace combustion chamber.
 3. Inspect for visible damage to compressor, coils, and fans.
 4. Inspect internal insulation.
 5. Verify that labels are clearly visible.
 6. Verify that clearances have been provided for servicing.
 7. Verify that controls are connected and operable.
 8. Verify that filters are installed.
 9. Clean condenser coil and inspect for construction debris.
 10. Remove packing from vibration isolators.
 11. Inspect operation of barometric relief dampers.
 12. Verify lubrication on fan and motor bearings.
 13. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 14. Adjust fan belts to proper alignment and tension.
 15. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
 16. Inspect and record performance of interlocks and protective devices; verify sequences.
 17. Operate unit for an initial period as recommended or required by manufacturer.
 18. Calibrate thermostats.
 19. Adjust and inspect high-temperature limits.
 20. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
 21. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F (8 deg C) above return-air temperature:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outdoor-air, dry-bulb temperature.
 - d. Outdoor-air-coil, discharge-air, dry-bulb temperature.
 22. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
 23. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.

- b. Return-air volume.
 - c. Relief-air volume.
 - d. Outdoor-air intake volume.
24. Simulate maximum cooling demand and inspect the following:
- a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.
25. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
- a. High-temperature limit on gas-fired heat exchanger.
 - b. Low-temperature safety operation.
26. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.5 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.
- B. After completing system installation and testing, adjusting, and balancing packaged unit and air-distribution systems, clean filter housings and install new filters.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain package unit. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

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SECTION 15815 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single wall round ducts and fittings.
 - 3. Double-wall round and oval ducts and fittings.
 - 4. Sheet metal materials.
 - 5. Duct liner.
 - 6. Sealants and gaskets.
 - 7. Hangers and supports.
- B. Related Sections:
 - 1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
 - 2. Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Factory- and shop-fabricated ducts and fittings.
 - 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - 4. Elevation of top of ducts.
 - 5. Dimensions of main duct runs from building grid lines.
 - 6. Fittings.
 - 7. Reinforcement and spacing.
 - 8. Seam and joint construction.

9. Penetrations through fire-rated and other partitions.
 10. Equipment installation based on equipment being used on Project.
 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
- D. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Manufacturer shall be Eastern Sheet Metal or approved equal. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 EXTERIOR DUCTWORK AND FITTINGS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Thermaduct, LLC.
- B. Rectangular Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct. The panel shall be manufactured of CFC-free Kingspan Kooltherm closed cell rigid thermoset resin thermally bonded on both sides to a factory applied .001" (25 micron) aluminum foil facing reinforced with a fiberglass scrim. An added UV stable, IR reflective 1000-micron high impact resistant titanium infused vinyl is factory bonded using a full lamination process. The lamination process shall permanently bond the vinyl clad to the outer surfaces of the phenolic foam panel to provide a zero-permeability watertight barrier and to form a structurally insulated panel (SIP) in which to form duct segments. Processes that do not employ a full lamination process are not acceptable. Self-applied adhesives such as tapes, caulks or cladding that incorporate pressure sensitive or spray adhesives are not acceptable.
- C. The thermal conductivity shall be no greater than $0.146\text{BTU} \cdot \text{in}/\text{Hr} \cdot \text{ft}^2 \cdot ^\circ\text{F}$ ($.018\text{W}/\text{m} \cdot ^\circ\text{C}$), the thermal conductivity shall be no greater than $0.146\text{BTU} \cdot \text{in}/\text{Hr} \cdot \text{ft}^2 \cdot ^\circ\text{F}$ ($.018\text{W}/\text{m} \cdot ^\circ\text{C}$)
- D. The density of the Kooltherm foam shall not be less than 3.5 pcf (56 Kg/m³) with a minimum compressive strength of 28 psi (.2 MPa).

- E. The standard panel is (31 mm) thickness panel with R-8.1 (1.5 RSI) shall be utilized unless indicated otherwise on the print.
1. Maximum Temperature: Continuous rating of 185 degrees F (70 deg C) inside ducts or ambient temperature surrounding ducts.
 2. Maximum Thermal Conductivity: 0.146 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 3. Permeability: 0.00 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.
 4. Antimicrobial Agent: Additive for antimicrobial shall not be used but instead, raw product must pass UL bacteria growth testing.
 5. Noise-Reduction Coefficient: 0.05 minimum when tested according to ASTM C 423, Mounting A.
 6. Required Markings: All interior duct liner shall bear UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for internal closure materials.
 7. All insulation materials shall be closed cell with a closed cell content of >90%.
8. R-value:
- a. 1 3/16 inch (31 mm) Thick Panel: 8.1 R
 - b. 1 3/4 (45 mm) Thick Panel: 12 R
 - c. 2 3/8" Double wall (62 mm) Thick Panel: 16.2 R
 - d. 3" Double wall (76 mm) Thick Panel: 20.1 R
 - e. 3.5" Double wall (100 mm) Thick Panel 24 R
- F. Closure Materials:
1. V-Groove Adhesive: Silicone (interior only).
 2. UV stable 1000-micron high impact resistant titanium infused vinyl (exterior).
 - a. Factory manufactured seamless corners for zero perms.
 - b. Cohesive bonded over-lap at corner seam covers for zero perms.
 - c. Water resistant titanium infused welded vinyl seams.
 - d. Mold and mildew resistant.
 3. Polymeric Sealing System:
 - a. Structural Membrane: Aluminum scrim with woven glass fiber with UV stable vinyl clad applied
 - b. Minimum Seam Cover Width: 2 7/8" inches (75 mm)
 - c. Sealant: Low VOC.
 - d. Color: White (colors, matched by architect optional).
 - e. Water resistant.
 - f. Mold and mildew resistant.
 4. Duct Connectors.
 - a. Factory manufactured galvanized 4-bolt flange.
- G. Outdoor Cladding
1. Thermaduct outdoor Installations: Duct segments shall incorporate UV stable 1000-micron high impact resistant titanium infused vinyl which is introduced during the manufacturing process.
- H. Flange coverings
- a. Flanges are field sealed airtight before flange covers are installed. Flange covering consists of the following:
 1. Foam tape insulation with molded 39 mil covers.
 2. Air gap (heating only application) with molded 39 mil covers.
- I. Reinforcement
1. Thermaduct shall provide designed and built with adequate reinforcement to both; withstand air pressure forces from within the duct from blower pressure and shall be built

to handle expected snow load for the location where the ThermaDuct is being installed. ThermaDuct will employ Airtruss™ reinforcement system when both specified static pressure and duct sizes dictate the need. This is a factory installed system and no field installation of the reinforcement system is required.

J. Weight

1. ThermaDuct shall provide low weight stresses on the building framing and support members. Assembled ThermaDuct shall have a weight of 0.86 lbs. per square foot to maximum weight of 2.7 lbs. per square foot (depending on R-value and reinforcement requirement). Hangers and tie-downs are to be detailed on the manufacturer's installing contractors detail drawings prior to installation but not exceeding 13' for duct girth <84" and 8' for duct girth >85" between hangers and designed to carry the weight and wind load of the ductwork.

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. McGill AirFlow LLC.
2. SEMCO Incorporated.
3. Sheet Metal Connectors, Inc.
4. Eastern Sheetmetal.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

a. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

a. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.

b. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Inner Duct: Minimum 0.028-inch (0.7-mm) solid galvanized sheet steel.
- E. Interstitial Insulation: Mineral Fiber duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.
 - 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F (0.034 W/m x K) at 75 deg F (24 deg C) mean temperature.

2.5 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180).
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.6 DUCT LINER

- A. Flexible Elastomeric Duct Liner: Manufacturer's shall be Aeroflex USA Inc., Armacell LLC, Rubatex International, LLC or approved equal. Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
 - 1. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 - 2. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
- B. Insulation Pins and Washers:
 - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
 - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
 - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 - 3. Butt transverse joints without gaps, and coat joint with adhesive.
 - 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.
 - 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 - 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s) or less.
 - 7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals

not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.

8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

2.7 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.8 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

New Gymnasium at Appalachian School
for the Blount County Board of Education
Appalachian, Alabama

METAL DUCTS
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- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 15 Section "Duct Accessories" for fire.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.
- F. Provide wall flange at all exposed wall penetrations.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and

Flexible."

- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
 - 3. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 4. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at maximum intervals of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 15 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.7 START UP

- A. Air Balance: Comply with requirements in Division 15 Section "Testing, Adjusting, and Balancing."

3.8 DUCT SCHEDULE

- A. Supply Ducts:

- 1. Ducts Connected to AC Units:
 - a. Pressure Class: Positive 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.

- B. Return Ducts:

- 1. Ducts Connected to AC Units:
 - a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.

- C. Exhaust Ducts:

- 1. Ducts Connected to Fans Exhausting Air:
 - a. Pressure Class: Negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.

- D. Outdoor-Air Ducts:

- 1. Ducts Connected to AHU:
 - a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.

- E. Intermediate Reinforcement:

- 1. Galvanized-Steel Ducts: Galvanized steel.

- F. Liner:

- 1. Supply Air Ducts: Flexible elastomeric, 1 inch (25 mm) thick (15' from AHU).
- 2. Return Air Ducts: Flexible elastomeric, 1 inch (25 mm) thick (15' from AHU).
- 3. Exhaust Air Ducts: None.
- 4. Transfer Ducts: Flexible elastomeric, 1 inch (25 mm) thick.

- G. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm (5 m/s) or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct

Construction Standards - Metal and Flexible," Figure 4-3, "Vaness and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

- c. Velocity 1500 fpm (7.6 m/s) or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vaness and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
- 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Welded.
- H. Branch Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 - 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

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SECTION 15820 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Barometric relief dampers.
 - 2. Manual volume dampers.
 - 3. Control dampers.
 - 4. Fire dampers.
 - 5. Turning vanes.
 - 6. Duct-mounted access doors.
 - 7. Flexible ducts.
 - 8. Fabric duct.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control damper installations.
 - d. Fire-damper installations, including sleeves; and duct-mounted access doors.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- D. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

1.5 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180).
 - 2. Exposed-Surface Finish: Mill phosphatized.

2.2 BAROMETRIC RELIEF DAMPERS

- A. Suitable for horizontal or vertical mounting.
- B. Maximum Air Velocity: 2000 fpm (10 m/s).
- C. Maximum System Pressure: 2-inch wg (0.5 kPa).
- D. Frame: 0.064-inch- (1.6-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.
- E. Blades:
 - 1. Multiple, 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.
 - 2. Maximum Width: 6 inches (150 mm).
 - 3. Action: Parallel.
 - 4. Balance: Gravity.
 - 5. Eccentrically pivoted.
- F. Blade Seals: Vinyl.
- G. Blade Axles: Galvanized steel.
- H. Tie Bars and Brackets:
 - 1. Material: Aluminum.
 - 2. Rattle free with 90-degree stop.
- I. Return Spring: Adjustable tension.
- J. Bearings: Synthetic.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel, 0.064 inch (1.62 mm) thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings:

- a. Oil-impregnated bronze.
- b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

7. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

- A. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- B. Frames:
 1. Hat shaped.
 2. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
 3. Mitered and welded corners.
- C. Blades:
 1. Multiple blades with maximum blade width of 8 inches (200 mm).
 2. Opposed-blade design.
 3. Galvanized steel.
 4. 0.064 inch (1.62 mm) thick.
 5. Blade Edging: Closed-cell neoprene edging.
 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- D. Blade Axles: 1/2-inch- (13-mm-) diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
 1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
- E. Bearings:
 1. Oil-impregnated bronze.
 2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 3. Thrust bearings at each end of every blade.

2.5 FIRE DAMPERS

- A. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.

- G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- H. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.6 FLANGE CONNECTORS

- A. Description: Add-on, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions.
- B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- C. Vane Construction: Single wall.

2.8 DUCT-MOUNTED ACCESS DOORS

- A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
 - d. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches.
 - d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

2.9 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC.

3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1 duct, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
 4. R-8 insulation valve.

2.10 FABRIC DUCTS

- A. Manufacturers: Subject to compliance with requirements, choose one of the following:
1. DuctSox® Corporation
Phone: (866) DUCTSOX or (563) 588-5300
FAX: (866) 398-1646 or (563) 588-5330
www.DuctSox.com

2.11 TEXTILE AIR DISPERSION SYSTEM

- A. SkeleCore FTS (Fabric Tensioning System): Air diffusers shall be constructed with internal tensioning frame.
1. System shall cylindrically tension textile along the entire length of textile duct, including all fittings (crosses, elbows, reducers, and tees).
 2. Tensioning system shall include full 360-degree tensioning and intermediate rings with quick connection spacer tubes concealed inside the fabric system.
 3. Interior structure to include multiple mechanically adjustable tension devices. To provide proper textile tensioning, structural and textile system shall be configured in segments of no more than 45 feet.
 4. Textile components supported solely by cylindrical metal rings.
 5. Each cylindrical ring shall require a vertical metal to metal cable safety attachment.
 - a. Vertical supports are Galvanized steel with available lengths of 5'(standard), 10', 15', & 30'.
 6. Available for diameters from 8" – 60".
 7. Not available for natatorium applications.
- B. Textile
1. Verona
 - a. Textile Construction: Filament/filament twill polyester, fire retardant in accordance with UL 2518.
 - b. Air Permeability: 2 (+2/-1) CFM/ft² per ASTM D737, Frazier
 - c. Weight: 6.8 oz. /yd² per ASTM D3776
 - d. Warranty: 15 years with standard inlet velocity.
 2. Textile Color
 - a. Architect to select.
- C. Textile System Fabrication Requirements:
1. Textile system to be constructed in modular lengths (zippered) with proper radial securing clips (inlets, endcaps, and mid-sections) and top access zippers for vertical cable safety attachment.

2. Integrated air dispersion shall be specified and approved by manufacturer. (select only those that apply)
 - a. Linear Vents
 1. Air dispersion accomplished by linear vent and permeable fabric. Linear vents must be sized in 1 CFM per linear foot increments (based on .5" SP), starting a 1 CFM through 90 CFM per linear foot. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface.
 2. Size of vent openings and location of linear vents to be specified and approved by manufacturer.
 - b. Orifices – 2" & 3" SG's (Sewn-in Grommets)
 1. Air dispersion and extended throws are accomplished by reinforced orifices and permeable fabric. Reinforced orifices are to be installed to keep the integrity of opening and withstand laundry processes.
 2. Diameter, quantity, and location of reinforced orifices to be specified and approved by manufacturer.
 - c. Fixed Nozzles
 1. Air dispersion accomplished by using conical aerodynamic nozzles and permeable fabric. Diameter of nozzles height to be minimum 1/2". Due to exact requirements of throw and maximum level of noise alternative flow models are not acceptable.
 2. Color of nozzles must match color of fabric. Unless otherwise specifically mentioned on drawings or otherwise in this specification, suppliers standard table is used for selection of color.
 3. Location and number of nozzles to be specified and approved by manufacturer.
 - d. Adjustable Nozzles
 1. Air dispersion accomplished by adjustable ball nozzles and permeable fabric. Adjustable ball nozzles to have multiaxial rotation to redirect airflow to desired area. Adjustable ball nozzles are able to completely close off airflow without adding caps or plugs. Adjustable ball nozzles should lock into place once set, preventing constant adjustment. Adjustable ball nozzle should have inset design to be a condensation resistant product.
 2. Colors of adjustable nozzles available are white and black. With white material receiving white adjustable nozzles and all other material colors receiving black adjustable nozzles unless otherwise specifically mentioned on drawings or otherwise in the specification.
 3. Quantity and location of adjustable ball nozzles to be specified and approved by manufacturer.
3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via. zip screw fastener – supplied by contractor.
4. Inlet connection includes zipper for easy removal / maintenance.
5. Lengths to include required intermediate zippers as specified by manufacturer.
6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
7. End cap includes zipper for easy maintenance.
8. Each section of the textile shall include identification labels documenting order number, section diameter, section length, piece number, code certifications and other pertinent information.

D. Design Parameters:

1. Textile air diffusers shall be designed from 0.25" water gage minimum to 3.1" maximum, with 0.5" as the standard.
2. Textile air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
3. System overall design: diameter, length, airflow, operating static pressure and dispersion shall be designed or approved by the manufacturer.
4. Do not use textile diffusers in concealed locations.
5. Use textile air dispersion systems only for positive pressure air distribution components of the mechanical ventilation system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire dampers according to UL listing.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 1. On both sides of duct coils.
 2. Upstream from duct filters.
 3. At outdoor-air intakes and mixed-air plenums.
 4. At drain pans and seals.
 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 6. Adjacent to and close enough to fire dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 7. Control devices requiring inspection.
 8. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).

4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 5. Body Access: 25 by 14 inches (635 by 355 mm).
 6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- J. Label access doors according to Division 15 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
 - K. Install flexible connectors to connect ducts to equipment.
 - L. Connect flexible ducts to metal ducts with draw bands.
 - M. Install duct test holes where required for testing and balancing purposes.

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.
- B. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire dampers according to UL listing.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 1. On both sides of duct coils.
 2. Upstream from duct filters.
 3. At outdoor-air intakes and mixed-air plenums.
 4. At drain pans and seals.
 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 6. Adjacent to and close enough to fire dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 7. Control devices requiring inspection.
 8. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).

4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 5. Body Access: 25 by 14 inches (635 by 355 mm).
 6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- J. Label access doors according to Division 15 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. Connect flexible ducts to metal ducts with draw bands.
- M. Install duct test holes where required for testing and balancing purposes.

4.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 3. Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.
 4. Inspect turning vanes for proper and secure installation.
 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

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SECTION 15838 - POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Ceiling-mounted ventilators.

1.2 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 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. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- C. UL Standard: Power ventilators shall comply with UL 705.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Loren Cook Company.
 - 2. Greenheck
- D. Description: Fan shall be ceiling mounted, direct driven, centrifugal exhaust fan.
- E. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements from smoke and heat generation.

- F. Fan Wheel: Centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA 204-05.
- G. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- H. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- I. Accessories:
 - 1. Fan Speed Controller: Pre-wired adjustable fan speed controller.
 - 2. Ceiling Radiation Damper (where required): Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
 - 3. Isolation: Rubber-in-shear vibration isolators.

2.2 MOTORS

- A. Comply with requirements in Division 15.
- B. Type: Motor shall be open drip proof type with permanently lubricated bearings and include impedance or thermal overload protection and disconnect plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Ceiling Units: Suspend units from structure; use steel wire or metal straps and vibration isolation kit.
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Division 15 Section "Mechanical Identification."
- E. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section 15820 "Duct Accessories."
- F. Install ducts adjacent to power ventilators to allow service and maintenance.

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in

- connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 10. Shut unit down and reconnect automatic temperature-control operators.
 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

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SECTION 15855 - DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed face registers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
- D. Source quality-control reports.

1.4 MANUFACTURERS

- 1. TITUS.
- 2. Metalaire.
- 3. Price.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:
 - 1. Devices shall be specifically designed for variable-air-volume flows.
 - 2. Material: Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Mounting: Surface or T-bar (see plans).
 - 5. Pattern: Adjustable.
 - 6. Dampers: Butterfly.

- B. Louver Face Diffuser:
 - 1. Devices shall be specifically designed for variable-air-volume flows.
 - 2. Material: Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Mounting: See plans.
 - 5. Pattern: See plans.
 - 6. Dampers: See plans.
 - 7. Accessories:
 - a. Square to round neck adapter.
 - b. Adjustable pattern vanes.

2.2 REGISTERS AND GRILLES

- 1. Material: Aluminum.
 - 2. Finish: Baked enamel, color selected by Architect.
 - 3. Face Blade Arrangement: Vertical spaced 1/2 inch (13 mm) apart.
 - 4. Core Construction: Removable.
 - 5. Rear-Blade Arrangement: Horizontal spaced 1/2 inch (13 mm) apart.
 - 6. Frame: 1-1/4 inches (32 mm) wide.
 - 7. Mounting: Concealed.
 - 8. Damper Type: Adjustable opposed blade.
- B. Fixed Face Register:
 - 1. Material: Aluminum.
 - 2. Finish: Baked enamel, white.
 - 3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
 - 4. Core Construction: Integral.
 - 5. Mounting: Lay in.
 - 6. Damper Type: Adjustable opposed blade.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb using factory painted screws. Screws with damaged heads will not be accepted.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

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SECTION 15900 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. General: Furnish and install a complete system of automatic temperature controls, as specified herein, as shown on the drawings and as required for a complete installation. All temperature control equipment shall be of the electric type.

1.2 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS:

- A. Approved Control System Contractors and Manufacturers: Schneider Electric (Albireo Energy), Trane, Automated Logic (Gulf States Automation) and Honeywell. Control work shall be installed by a control contractor.

PART 2 - PRODUCTS

2.1 CONTROL EQUIPMENT AND SYSTEMS:

- A. Thermostats (T): Shall be Schneider Electric SE8000 (architect to select housing color) series or approved equal. (Note: If SE8000 is provided with CO2 and RH capabilities then items B and C below can be omitted)
1. Supply Input Voltage: 24 V AC 50/60Hz \pm 15%
 2. Input Voltage: 0-10 VDC
 3. Input Type: Dry contact 2, Analog 5
 4. Temperature Sensor Type: 10kOhm T2 NTC thermistor
 5. Accuracy: Temperature \pm 0.5°C, Humidity \pm 5%, 20-80% RH
 6. Output Voltage: 24V AC/DC relay output 0-10V AC/DC voltage output
 7. Output Type: 5 relay output, 4 universal
 8. Communication port protocol: BACnet/MS/TP, Modbus RTU, Zigbee Pro
- B. Carbon Dioxide (CO2) Sensors: Shall be Senva CT1R-A3D or approved equal.
1. Power Supply: 12-30 VDC / 24 VAC, 100mA max.
 2. Analog Output: 3-wire 4-10mA and 0-5V/0-10V (dip switch selectable)
 3. Digital Setpoint Output: Solid State, 1A @ 30VAC/DC, N.O.
 4. Sensor Type: Non-dispersive infrared (NDIR)
 5. Accuracy: \pm (30ppm +3%reading)(400-2000ppm), @-10-50°C
 6. Range: 0-2000/5000ppm: Programmable up to 10,000ppm
 7. Response Time: 60s to 90% reading
- C. Humidity (H) Sensors: Shall be Veris HW2L or approved equal.
1. Power Supply: Class 2; 20 to 30 VDC, 24 VAC, 50 to 60 Hz
 2. Analog Output: Selectable 4 to 20 mA, 0 to 5 V, 0 to 10 V
 3. Digital Setpoint Output: 0 to 10 V Output, Scale: 50 to 95°F/32 to 122°F
 4. Sensor Type: Thin-film capacitive, replaceable
 5. Accuracy: \pm 2% from 10 to 80% RH @ 77°F
 6. Range: 0 to 100% RH
- D. Control Damper: Shall be furnished by temperature control contractor. See "Motor Operated Volume Damper" specification. Ruskin CD40 or approved equal.

- E. Control Damper Actuators:
 - 1. Electronic damper operators: shall be two positions direct coupled with spring return. Belimo or equivalent.
 - 2. Motors: shall be low voltage synchronous type and shall be non-overloading at a continuous stall.
 - 3. Actuators: shall be selected, mounted, and tested for proper operation based on size, type, and torque requirements.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Interface with Other Work:
 - 1. Calibrate room thermostats as required during air test & balance.
 - 2. Instruct air test & balance personnel in proper use and setting of control system components.
- B. Run wiring in conduit in exposed areas. No exceptions.
- C. Safety Controls:
 - 1. Mount smoke detector in return ducts (before the introduction of outdoor air) of each ducted heating and/or cooling system and interlock to keep heating and cooling from operating if detector is energized.
 - 2. Interlock electric heaters with cooling compressors and supply air fan.
 - 3. Check high limit thermostats furnished with heating equipment for correct operation. Electric heaters shall cut-off when duct temperature exceeds high limit setting.
 - 4. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.
- D. Provide adjustable time delay timer for each AC system to offset unit starts.
- E. Mount damper actuators and actuator linkages external of air flow.
- F. Provide fresh battery in each thermostat and instruct owner in battery replacement.
- G. Paste copy of record control wiring diagram on back of relay panel door cover for each heat pump system.
- H. Manufacturer's Field Service:
 - 1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-final inspection.
- I. Program thermostats per owner's request time schedule.
- J. Provide lockable or protective covers on wall controllers.

END OF SECTION

SECTION 15940 -SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment.
- B. See Division 15 Section "HVAC Instrumentation and Controls" for control equipment and devices and for submittal requirements.

1.2 CONTROL SEQUENCES

- A. Constant Volume Package AC Units (RTU-1, 2, and PAC-1):
 - 1. Each Package Unit shall be started and stopped by a 7-Day Programmable Touch Screen Thermostat – (Schneider Electric 8000 Series or Honeywell TC500).
 - 2. When the Thermostat activates the unit, the fan shall start, and the room sensor shall control the unit. The Thermostat shall stage the DX cooling or modulating gas furnace to maintain temperature setpoint. When the Thermostat de-activates the unit, the fan shall stop, and the outdoor air damper shall close.
 - 3. Each unit shall have a low limit and high limit sensor for sequencing. On a drop in space temperature below 55° F. (adj.) the unit shall cycle the modulating natural gas furnace until space temperature reaches 60° F (adj.). On a rise in space temperature above 85°F (adj.) the unit shall start the DX cooling and run until space temperature reaches 80°F (adj.).
 - 4. Outdoor Air: When unit runs in occupied mode, the O.A. damper shall open to maximum position and the return damper shall close to minimum position. When unit runs in unoccupied mode, the O.A. damper shall close, and the return air damper shall open to maximum position. CO2 Sensors – When CO2 level reaches 1000 ppm, the O.A. damper shall open to maximum position and the return damper shall close to minimum position. When CO2 level drops below 1000 ppm, the O.A. damper shall close to minimum position and the return air damper shall open to maximum position.
 - 5. Dehumidification: On a call for dehumidification, the hot gas reheat valve shall energize and both compressors shall enable. When the humidity control setpoint is satisfied, the valve shall de-energized and both compressors shall be disabled. If there is a call for 1st stage cooling while in dehumidification mode, no action shall take place. If there is a call for 2nd stage cooling, the hot gas reheat valve shall be de-energized, and the unit shall revert to the cooling mode. If 2nd stage cooling is satisfied and there is still a call for dehumidification, the hot gas reheat valve shall once again be energized.
 - 6. Relief Air and Building Pressure Control: The barometric relief dampers shall open with increased building pressure. As the building pressure increases, the pressure in the return section also increases, opening the dampers and relieving air.
 - 7. Occupied Mode Operation: During occupied times, the supply fan shall run continuously, and the outdoor air dampers shall open to maintain minimum ventilation requirements. The DX cooling and the gas furnace shall control the active discharge air temperature setpoint.
 - 8. Unoccupied Mode Operation: When the space temperature is below the unoccupied heating setpoint of 60.0 deg. F. (adj.) the supply fan shall be commanded on, the outside

air damper shall remain closed, and the gas furnace shall be enabled. When the space temperature rises above the unoccupied heating setpoint of 60.0 deg. F. (adj.) the supply fan shall stop, and the gas furnace shall be disabled. When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F. (adj.) the supply fan shall be commanded on, the outside air damper shall remain closed, and the DX cooling shall be enabled. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F. (adj.) the supply fan shall stop, and the DX cooling shall be disabled.

- B. Ceiling Mounted Exhaust Fans: Each fan shall be interlocked/controlled as indicated in Exhaust Fan Schedule. Provide a manual motor starter and fan speed controller with an "Off-On" switch at each fan. See electrical drawings for switch location.
- C. Fire Alarm Control: Upon a receipt of an alarm from the building fire alarm system, all AC units shall be shut down.
- D. Operational Schedules: Obtain yearly operational schedule from Owner. If no schedule can be confirmed, program controller to place all equipment into occupied mode from 6:00 am to 6:00 am, Monday through Friday, with the exception of holidays.
- E. Ductless Mini-Split Heat Pump Unit: Control with factory 7-day programmable wall mounted thermostat.
 - 1. When the Thermostat activates the unit, the fan shall start, and the room sensor shall control the unit. The Thermostat shall stage the DX cooling or heat pump heat to maintain temperature setpoint. When the Thermostat de-activates the unit, the fan shall stop.
 - 2. Each heat pump shall have a low limit and high limit sensor for sequencing. On a drop in space temperature below 55° F. (adj.) the heat pump shall cycle the heat pump until space temperature reaches 60° F (adj.). On a rise in space temperature above 85°F (adj.) the heat pump shall start the DX cooling and run until space temperature reaches 80°F (adj.).
- F. Wall mounted electric heaters: shall be started and stopped by factory integral adjustable thermostat.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 15950 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS:

- A. Certified TAB reports.
- B. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.
 - 1. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 COORDINATION

- A. Notice: Provide three days' advance notice for each test. Include scheduled test dates and times.

- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB 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. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 15 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION:

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - Permanent electrical-power wiring is complete.
 - 1.

2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING:

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 15 Section "Duct Accessories."
 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 15 Section "HVAC Insulation."
- C. 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.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS:

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- 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. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Division 15 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS:

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 15 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 7. 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, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS:

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

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1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

3.7 PROCEDURES FOR CONDENSING UNITS:

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS:

- A. Measure, adjust, and record the following data for each electric heating coil:
 1. Nameplate data.
 2. Airflow.
 3. Entering- and leaving-air temperature at full load.
 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 5. Calculated kilowatt at full load.
 6. Fuse or circuit-breaker rating for overload protection.
- B. Measure, adjust, and record the following data for each refrigerant coil:
 1. Dry-bulb temperature of entering and leaving air.
 2. Wet-bulb temperature of entering and leaving air.
 3. Airflow.
 4. Air pressures drop.
 5. Refrigerant suction pressure and temperature.

3.9 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS:

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check the refrigerant charge.
 4. Check the condition of filters.
 5. Check the condition of coils.
 6. Check the operation of the drain pan and condensate-drain trap.
 7. Check bearings and other lubricated parts for proper lubrication.
 8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 1. New filters are installed.
 2. Coils are clean and fins combed.
 3. Drain pans are clean.
 4. Fans are clean.
 5. Bearings and other parts are properly lubricated.
 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.10 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus, or minus 10 percent.
 2. Air Outlets and Inlets: Plus, or minus 10 percent.

3.11 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Pipe and valve sizes and locations.
 4. Balancing stations.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches (mm), and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
 3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg (Pa).
 - e. Filter static-pressure differential in inches wg (Pa).
 - f. Preheat-coil static-pressure differential in inches wg (Pa).
 - g. Cooling-coil static-pressure differential in inches wg (Pa).
 - h. Heating-coil static-pressure differential in inches wg (Pa).
 - i. Outdoor airflow in cfm (L/s).
 - j. Return airflow in cfm (L/s).
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
- F. Apparatus-Coil Test Reports:
1. Coil Data:

- a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch (mm) o.c.
 - f. Make and model number.
 - g. Face area in sq. ft. (sq. m).
 - h. Tube size in NPS (DN).
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
- a. Air flow rate in cfm (L/s).
 - b. Average face velocity in fpm (m/s).
 - c. Air pressures drop in inches wg (Pa).
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
 - e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
 - f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
 - h. Water pressure differential in feet of head or psig (kPa).
 - i. Entering-water temperature in deg F (deg C).
 - j. Leaving-water temperature in deg F (deg C).
 - k. Refrigerant expansion valve and refrigerant types.
 - l. Refrigerant suction pressure in psig (kPa).
 - m. Refrigerant suction temperature in deg F (deg C).
- G. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
1. Unit Data:
- a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btu/h (kW).
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Air flow rate in cfm (L/s).
 - i. Face area in sq. ft. (sq. m).
 - j. Minimum face velocity in fpm (m/s).
2. Test Data (Indicated and Actual Values):
- a. Heat output in Btu/h (kW).
 - b. Air flow rate in cfm (L/s).
 - c. Air velocity in fpm (m/s).
 - d. Entering-air temperature in deg F (deg C).
 - e. Leaving-air temperature in deg F (deg C).
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- H. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
- a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.

- e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches (mm), and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
2. Motor Data:
- a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
 - g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg (Pa).
 - e. Suction static pressure in inches wg (Pa).
- I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
- a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F (deg C).
 - d. Duct static pressure in inches wg (Pa).
 - e. Duct size in inches (mm).
 - f. Duct area in sq. ft. (sq. m).
 - g. Indicated air flow rate in cfm (L/s).
 - h. Indicated velocity in fpm (m/s).
 - i. Actual air flow rate in cfm (L/s).
 - j. Actual average velocity in fpm (m/s).
 - k. Barometric pressure in psig (Pa).
- J. Instrument Calibration Reports:
1. Report Data:
- a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.13 INSPECTIONS:

- A. Initial Inspection:
- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- B. Final Inspection:
- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.

2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Engineer.
 3. Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

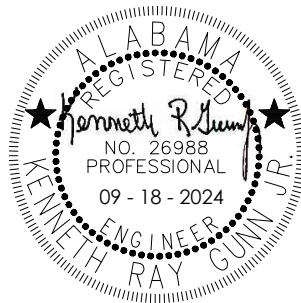
3.14 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

DIVISION 16

ELECTRICAL



Prepared by Kenneth R. Gunn Jr. P.E.

SECTION 16100
ELECTRICAL

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 specified in this section.

1.02. QUALIFICATIONS OF ELECTRICAL CONTRACTORS:

- A. Electrical contractor must be properly established as an electrical contractor by the State of Alabama. Electrical contractor shall have had previous experience in the satisfactory installation of at least three systems of this type and size in the State of Alabama.

1.03. CODES, PERMITS AND INSPECTIONS:

- A. Comply with applicable laws of the community, with latest edition of National Electrical Code (NEC), NFC 70, and the International Building Code (IBCC) or the edition adopted by the local authority having jurisdiction, where not in conflict with those laws, and with the service rules of the local utility company.
- B. Obtain and pay for all permits and deposits and arrange for inspections as required.
- C. After completion of the work, submit certificate of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.04. MATERIALS:

- A. All materials shall be new, and UL approved where a standard has been established.
- B. Manufacturers' names and model numbers shown on the plans and in the specifications are given to indicate the type and general quality of items to be provided. Equal products by other manufacturers will be accepted.
- C. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect/Engineer has been presented in writing, with samples if requested by the Architect/Engineer. All prior approvals must have the approval of the engineer of record at the offices of Gunn and Associates, P.C. located at 3102 Highway 14, Millbrook, AL 36054, Phone: 334-285-1273
- D. All proposed substitutions shall be approved in writing at least ten (10) days prior to the bid date.
- E. It shall be understood that the Architect/Engineer has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

1.05. WORKMANSHIP:

- A. Execute all work so as to present a neat and workmanlike appearance when completed.

1.06. DESCRIPTION OF WORK:

- A. Furnish all labor and materials required to complete the electrical work indicated on the drawings or herein specified. Major work included in Section 16 shall be:
- B. Prior to bid it is the contractor's responsibility to re-affirm with the power company the service requirements to the facility as indicated on the electrical drawings. If any changes or additions to the service lateral installation indicated on the drawings is required by the utility company the contractor shall include the cost of these changes in his/her bid. Additionally, any/all charges for electrical service to the facility (aid-to-construction) by the utility company shall be included in the contractor's bid price.

- C. Remove or relocate all electrical or electronic services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the complete project or any code pertaining thereto.
- D. Furnish and install a complete electrical light and power system including but not limited to the connection of all meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, lighting fixtures, switches, and/or other equipment forming part of the electrical system.
- E. Furnish and install a complete system of outlet boxes, face plates, conduit raceways, backboard, and service entrance conduit for the communications system.
- F. Furnish and install a complete system of outlet boxes, face plates, conduit raceways, Category 6 cables, backboards, patch panels, and fiber optic cables and patch panels for the Data System.
- G. Connect all electrical equipment whether furnished by this contractor or by others.
- H. Furnish and install all disconnect switches not included as an integral part of equipment.
- I. Furnish and install a complete Lighting Control System.
- J. Furnish and install a complete Fire Alarm System compliant with applicable provisions of the International Building Code (IBC) and the National Fire Protection Association (NFPA) Standard No. 72.
- K. Furnish and install a complete Intercom System.
- L. Furnish and install a complete Program Bell System.
- M. Complete the alterations, additions, and renovations to the electrical system in the existing building as specified herein or as shown on the drawings.
- N. Procure and pay for permits and certifications as required by local and state ordinances and Fire Underwriters certificate of inspection.
- O. Visit the site and determine conditions that affect this contract. Failure to do so will in no way relieve the Contractor of his responsibility under his contract.
- P. Submit to the Architect a certificate of final inspection from local and/or state inspection authorities.
- Q. Establish and maintain temporary electrical services for construction purposes.

1.07. DRAWINGS AND SPECIFICATIONS:

- A. This Contractor shall examine drawings and Specifications relating to the work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid and prior to the start of any construction.
- B. Drawings and Specifications shall be considered as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from the Architect in advance of bidding; otherwise incorporate the more stringent conditions into the bid price.
- C. Omissions from the drawings and specifications or the mis-description of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omissions and details of work; they shall be performed as if fully and correctly set forth and described in the drawings and specifications.
- D. The drawings indicate diagrammatically the extent, general character, and the approximate location of the work to be performed. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, locations of conduit, fixtures, outlets, and equipment with the detailed architectural, structural, and mechanical drawings, and lay out work so as to fit in with ceiling grids, ductwork, sprinkler piping and heads, and other parts. Take finished dimensions at the job site in preference to using scale dimensions.
- E. Where the work is indicated but with minor details omitted, furnish and install the work complete so as to perform its intended functions.

- F. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- G. Except as noted above, make no changes in or deviations from the work as shown or specified except on written order of the Architect.

1.08. EXISTING CONDITIONS:

- A. Before submitting a bid, visit the site and ascertain all existing conditions.
- B. Make such adjustments in work as are required by the actual conditions encountered.
- C. No consideration will be given after bid opening for alleged misunderstandings regarding utility connections, integration of work with existing system, or other existing conditions.

1.09. SUBMITTALS:

- A. Follow procedure outlined in Division 1.
- B. Submittals shall be bound together and shall include a coversheet indicating the following:
 - 1. Project name
 - 2. Trade contractor's name
 - 3. Supplier's name
 - 4. Name and phone number of supplier's contact person
 - 5. A list of each item submitted with manufacturers' names and model numbers.
- C. Within 20 days of award of contract and prior to beginning any work on the project submit six (6) copies of manufacturer's drawings/data sheets for the following items to the Engineer for review:
 - 1. Conductors
 - 2. Cable Pulling tensions. Provide cable pull tension calculations (lateral and longitudinal) on all underground cable runs over 150 feet for cables sized #1 and larger. Provide one line diagram indicating pulling tensions on each run and number and size of each pull box along anticipated route. Calculations shall include changes in direction or elevation of feeder runs.
 - 3. Wiring Devices
 - 4. Conduit Wrapping Tape
 - 5. Panelboards
 - 6. Power system breaker coordination. Submit proper breaker settings recommendations with breaker coordination study.
 - 7. Contractor shall coordinate with mechanical/plumbing shop drawings prior to submitting power package to engineer. Adjust overcurrent devices accordingly.
 - 8. Disconnect Switches
 - 9. Dry Type Transformers
 - 10. Fire Stopping
 - 11. Lighting Control System: Include conduit and cable layout, terminal to terminal wiring showing color code and wire numbers, and complete technical data on each system component. Furnish the Owner one set of as built drawings at completion of the project. Coordinate with lighting control riser on drawings for further shop drawings requirements.
 - 12. Lighting Fixtures (include photometric data for each fixture)
 - 13. Fixture Support Equipment
 - 14. Data/Telecommunications System
 - a. Cable
 - b. Equipment
 - c. Installer qualifications
 - d. Makes and Model Numbers of Testing Equipment to be used.
 - 15. Secondary Surge Arresters
 - 16. Transient Voltage Surge Suppressors(Surge Protective Devices)
 - 17. **Fire Alarm System: The fire alarm shop drawings shall bear the approval of the fire protection provider to ensure all supervisory valves and flow switches are being monitored by the fire alarm system. Coordinate with fire protection provider prior to**

bid and provide monitoring for all supervisory valves and flow switches for entire building. Coordinate with sprinkler system designer and provide additional heat detection (if required) and associated circuiting in elevator shafts and equipment rooms to comply with applicable sections of NFPA and ANSI A17.1. Bid accordingly. Include conduit and cable layout, battery calculations, terminal to terminal wiring showing color code and wire numbers, and complete technical data on each system component. Additionally, the contractor or his/her fire alarm system vendor shall provide audibility calculations indicating compliance with all applicable provisions of NFPA 72 and the IBC. The contract drawings indicate a minimum design required to comply with applicable codes. However, since devices vary from manufacturer to manufacturer the contractor shall be responsible for furnishing any/all additional devices as required to provide audibility and visibility levels that comply with applicable sections of NFPA 72 and IBC. Furnish the Owner one set of as built drawings at completion of the project. Provide a copy of the fire alarm contractor's State Fire Marshal's Permit with the submittals for approval.

18. **Fire Alarm Submittals: Alabama DCM projects will be required to provide a courtesy set of approved fire alarm submittals to the local fire department for their records. Not for review, but only for their records.**
 19. Intercom System
 20. Program Clock and Bell System
 21. Clocks
 22. Cable Tray or Cable Basket.
 23. J-Hooks
- D. Submit samples upon request.
- E. The Contractor is responsible for verifying all quantities and for verifying and coordinating dimensional data with the available space for items other than the basis of design.
- F. **Provide a 1/2" = 1'- 0" scale drawing of all electrical rooms containing more than a single panelboard section or containing a panelboard and other electrical and/or mechanical equipment. These drawings shall be submitted along with equipment data sheets. Note we will no longer review submittals that does not have this information. Any delay will be the responsibility of the contractor for not submitting these drawings of the electrical rooms. Power submittals will be returned rejected without these drawings.**
- G. The contractor shall review and approve or make appropriate notations on each item prior to submittal to the architect. Submittals without contractor's approval will be rejected.
- H. Submittal reviews will be performed up to two times to review material submitted by contractor. Gunn & Associates will charge a review fee of a \$1,000 to review submittals starting the third time submitted. If contractor needs Gunn & Associates, P.C. to perform another review of material after submittals have been submitted and approved to change manufacturers. A review cost of \$1,000 per review. Payment must be received by Gunn & Associates prior to scheduling any additional reviews.

1.10. COORDINATION OF SERVICE WITH OTHER TRADES:

- A. It shall be the responsibility of the Electrical Contractor to coordinate the electrical service characteristics to each piece of electrically operated equipment with all trades providing electrically operated equipment.
- B. Within ten (10) working days of notification to proceed with construction from the Architect, the Electrical Contractor shall notify, in writing, all trades providing electrically operated equipment the characteristic of the electrical power being supplied to each piece of electrically operated equipment.
- C. A copy of this notification shall be provided to the General Contractor and the Architect.
- D. Be informed as to equipment being furnished by other trades, but not liable for added cost incurred by equipment substitutions made by others which require excess electrical wiring or equipment above that indicated on drawings or specified.
- E. The contractor providing the equipment shall be responsible for the additional costs.

1.11. PROGRESS OF WORK:

- A. Schedule work as necessary to cooperate with other trades, Do not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.

1.12. PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION:

- A. Take all precautions necessary to provide safety and protection to persons and the protection of materials and property.
- B. Protect items of equipment from stains, corrosion, scratches, and any other damage or dirt, whether in storage, at job site or installed. No damaged or dirty equipment, lenses, or reflectors will be accepted.
- C. Live panelboards, outlets, switches, motor control equipment, junction boxes, etc., shall be protected against contact of live parts and conductors by personnel.

1.13. CLEANING UP:

- A. During the progress of work, keep the Owner's premises in a neat and orderly condition, free from accumulation of debris resulting from this work. At the completion of the work, remove all material, scrap, etc. not a part of this Contract.

1.14. AS-BUILT DRAWINGS, AND OPERATING AND MAINTENANCE INSTRUCTIONS:

- A. Prior to the Final Acceptance Inspection the Contractor shall turn over to the Architect one set of reproducible "as built" drawings, including corrected fire alarm system shop drawings, three (3) sets of all equipment catalogs and maintenance data, manufacturers' warranties, and three (3) sets of shop drawings on all equipment.

1.15. TESTING:

- A. Upon completion of the work, conduct a thorough test in the presence of Architect or his representative, and demonstrate that all systems are in perfect working condition.

1.16. INSPECTIONS:

- A. The contractor shall have all systems ready for operation and an electrician available to remove panel fronts, coverplates, fixture doors, etc., at the final inspection and any other scheduled inspections.
- B. It is the contractor's responsibility to have the job ready for inspections when they are scheduled. We will perform inspections as required by our contract. If project is not ready during inspection and requires a re-inspection by Gunn & Associates, then the contractor shall pay Gunn & Associates, P.C. for the re-inspection. The payment shall be made directly to Gunn & Associates, P.C. in the amount to be determined by engineer. Not to exceed \$1,500 for single re-inspection fee. Payment must be received by Gunn & Associates prior to scheduling re-inspection.
- C. Inspections for Temporary or Permanent Power required by any utility companies are not in our scope of work. If contractor needs Gunn & Associates, P.C. to perform inspections, contractor must include an inspection cost of \$1,000 per inspection in their base bid. Payment must be received by Gunn & Associates prior to scheduling inspection.

1.17. DEMONSTRATION:

- A. By on-off, stop-start operation, demonstrate to the Owner or his representative, the use, working, resetting, and adjusting of each and every system. Submit statement initialed by the Owner that such demonstration has been made.

1.18. WARRANTY:

- A. Warrant the entire electrical system in proper working order. Replace, without additional charge, all work or material that may develop defects (ordinary wear and tear or damage resulting from improper handling excepted) within a period of one year from date of final to general contractor. Provide the owner with two bound copies of all manufacturers' warranties.
- B. Data and Telecommunications system cabling shall be warranted for a minimum of 15 years.

1.19. TEMPORARY SYSTEMS:

- A. The Electrical Contractor shall be responsible for furnishing and installing equipment and materials necessary for providing electrical power and lighting where needed for the construction of the project.
- B. Electrical Contractor will be responsible for paying for and providing temporary construction power and lighting for entire job site. Coordinate with local jurisdictions and utility companies and pay all fees necessary to get temporary power to the job site. General Contractor shall be responsible for all monthly utility cost for duration of project or date of substantial completion.

1.20. SERVICE INTERRUPTION CLEARANCE WITH OWNER:

- A. Before submitting a proposal, check with the Owner concerning interruption of service to the existing electrical systems. No interruption shall be made except at such time and for such duration as approved by the Owner. The Contractor's bid shall include all necessary over-time and weekend work.

1.21. DEFINITIONS:

- "AWG" - American Wire Gauge
- "ADA" – Americans with Disabilities Act
- "As required" - Any and all items required to complete the installation of an item so as to perform its intended function.
- "Circuiting" - Conductors, raceways, raceway fittings, and associated hardware.
- "EMT" – Electrical Metallic Tubing, "thin wall"
- "IBC" – International Building Code
- "Install" - furnish, install, and make all necessary connections to and/or for the item(s) indicated or specified.
- "NEC" - National Electrical Code, ANSI/NFPA 70, latest edition or the edition adopted by the authority having jurisdiction.
- "Necessary" - Any and all items required to complete the installation of an item so as to perform its intended function.
- "NEMA" - National Electrical Manufacturers' Association
- "NFPA" - National Fire Protection Association
- "PVC Conduit" – Rigid Nonmetallic Polyvinyl Chloride conduit
- "RGS Conduit" – Rigid galvanized steel conduit
- "UL" - Underwriters' Laboratories, Inc.

PART 2 - MATERIALS

2.01. GENERAL:

- A. This section includes all basic materials for raceways, fittings, busways, conductors, panelboards, switchboards, lighting fixtures and accessories, etc., as required for a complete installation.
- B. All materials shall be new and listed by the Underwriters Laboratories. Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect has been presented in writing, with samples if requested by the Architect.
- C. It shall be understood that the Architect/Engineer has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

2.02. CONDUITS:

- A. Rigid Metal (Galvanized Steel-RGS) Conduit: Rigid metal conduit shall be mild steel piping, galvanized inside and outside, and conform to ASA Specification 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.
- B. ***Conduit systems are subject to system color identification the complete length for the conduit system for the system they contain and as identified by these specifications:***

- C. Intermediate Metal Conduit (IMC): IMC shall be hot dipped galvanized inside and outside and manufactured in accordance with U.L. Standard #6 or #1242. By Allied or approved equal.
- D. Electrical Metallic Tubing (EMT): EMT shall be high grade steel electro-galvanized outside and lacquer or enamel coating inside and conform to ASA Specifications 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.
- E. Rigid Nonmetallic Conduit (PVC): PVC conduit where exposed shall be high impact Schedule 80; below ground and below or in slab PVC shall be of high impact Schedule 40 PVC and shall conform to Underwriters' Laboratories Standard UL-651. By Carlon, Kraley Pittsburgh, R.G. Sloan or Southwestern.
- F. Rigid Aluminum: Rigid Aluminum conduit shall be manufactured from 6063, t-1 aluminum alloy and shall meet the requirements of Federal Spec. WW-C-540c and ANSI C80.5 and shall be U.L. listed in accordance with UL-6. Equal to products by V.A.W. of America.

2.03. COUPLINGS, FITTINGS, AND CONNECTORS:

- A. RGS & IMC: By Appleton, Crouse-Hinds, Efcor, O-Z/Gedney, Raco, or Republic.
- B. EMT: EMT fittings shall be all steel type setscrew or insulated throat compression type. Pressure indented or slip fit type will not be accepted. All connectors to be insulated. By Appleton, Efcor, Raco Steel City, or Thomas & Betts.
- C. PVC: PVC fittings shall be of high impact PVC Schedule 40 or Schedule 80 to match the installed conduit. Joints shall be made with PVC solvent cement as recommended by manufacturer. By Pittsburgh, R.G. Sloan or Carlon.
- D. Rigid Aluminum: Fittings used with Rigid Aluminum conduit shall be formed of the same alloy as the conduit or shall be copper free cast aluminum unless specifically indicated otherwise.

2.04. CONDUIT BODIES:

- A. Conduit bodies shall be malleable iron except in kitchen, dishwashing, and waste water treatment areas conduit bodies shall be copper free cast aluminum with stamped aluminum covers.
- B. Covers shall be screw retained with wedge nut or threaded body. Covers on bodies installed outdoors shall be approved and rated for installation outdoors.
- C. Bodies shall comply with NEC 370 and 373.
- D. RGS & IMC: By Appleton, Crouse-Hinds, Efcor, O-Z/Gedney, Raco, or Republic.
- E. Conduit cannot be used as ground. Provide separate insulated green grounding wire.

2.05. BUSHINGS:

- A. Bushings up to and including 1" shall have a tapered throat.
- B. Bushings 1-1/4" and larger shall be the insulating type.
- C. Grounding bushings shall be specification grade insulated grounding type bushings with tin plated copper grounding saddles and shall be equal to O-Z/Gedney Type BLG or HBLG.
- D. Bushings shall be zinc plated malleable iron or copper free cast aluminum.
- E. Bushings for terminating Data, Telecommunications, control, CATV, and similar conduits above ceilings and at backboards may be PVC or Polyethylene insulating bushings equal to those manufactured by Arlington Industries and Bridgeport Fittings.

2.06. EXPANSION FITTINGS:

- A. Conduit Expansion Joints shall be UL Listed.
- B. Expansion joints in rigid metal conduits shall consist of a threaded malleable iron body, pressure bushing, watertight packing, pressure ring, gasket, insulating bushing, and external grounding jumper, and shall be equal to O-Z Gedney Type AX with Type BJ bonding jumper.
- C. Expansion joints for EMT conduit shall be same as above with additional EMT couplings and connectors and shall be equal to O-Z Gedney Type TX with Type BJ bonding jumper.
- D. Expansion joints in PVC conduit shall be equal to Carlon Series E945.

- E. Expansion joints shall provide a minimum of 4" of conduit movement.

2.07. BELOW GRADE THRU WALL WATER SEALS:

- A. Thru wall water seals for conduits penetrating exterior below grade concrete walls shall be seal systems by O-Z/Gedney or The Metraflex Company.
- B. Thru wall water seals for conduits penetrating exterior below grade concrete walls shall be Metraseal thru wall water seals by The Metraflex Company.

2.08. CONDUIT ACCESSORIES:

- A. Conduit clamps and supports for metallic conduit shall be galvanized steel by Efcor, Steel City, or Mineralac. Conduit fittings by Appleton, Crouse-Hinds, O-Z/Gedney, Pyle-National or approved equal.
- B. Conduit clamps and supports for nonmetallic conduit shall be nonmetallic high impact PVC by Carlon, Pittsburg, or Sloan.
- C. Conduit clamps for aluminum conduits shall be stainless steel or cast copper free aluminum with stainless steel fasteners.

2.09. FLEXIBLE CONDUIT:

- A. Liquidtight flexible metal conduit:
 - 1. Neoprene-jacketed liquidtight flexible metal conduit.
 - 2. Equal to Anaconda Sealite.

2.10. ELECTRICAL TAPES:

- A. General use electrical tape shall be 8 mil (.008") thick, minimum, premium grade, pressure sensitive, flame retardant, vinyl electrical tape meeting UL 510, ASTM-D-3005, and MIL-I-24391C. The tape shall be equal to 3M No. 88 or Plymouth Premium 85 CW.
- B. Rubber tape used as primary tape shall be a 30 mil (.030") thick, minimum self-amalgamating, low voltage rubber tape rated for use through 600 V. Rubber tape shall be equal to 3M No. 2150 or Plymouth 122 Rubber Tape.
- C. Electrical filler tape shall be a 125 mil (.125") thick, minimum, self-amalgamating, low voltage insulating compound rated for use through 5 kV. Filler tape shall be equal to 3M SCOTCHFILL or Plymouth 125 Electrical Filler Tape.

2.11. PIPE WRAPPING TAPE:

- A. Pipe wrapping tape shall be a 10 mil (.010") thick, minimum, pressure sensitive, vinyl tape manufactured for pipe wrapping applications.
- B. The tape shall be UV, bacteria, and fungus resistant.
- C. The manufacturer's name and tape type shall be printed on the back of the tape.
- D. Pipe wrapping tape shall be equal to Plymouth Rubber Co. PLYWRAP 11, or 3M No. 50.

2.12. WIRE NUTS:

- A. Wire nuts for conductor splicing shall be winged type connectors with a square, plated steel spring and flame-retardant thermoplastic shell.
- B. The connector shall be rated for the number and size conductors being connected.
- C. The Wire Nuts shall be rated for 105°C. And UL 486C listed.
- D. Wire nuts shall be equal to connectors by Ideal/Buchanan, 3M/Scotch, or T & B,

2.13. SPLIT BOLT CONNECTORS:

- A. Split bolt connectors for splicing conductors shall be UL 486A listed, shall be tin plated copper, and shall have a hexagonal head and nut.
- B. Split bolt connectors for conductors sized AWG #4 and larger shall have a serrated spacer bar between conductors.
- C. Split bolt connectors for splicing conductors AWG #12 through #6 shall be equal to IlSCO Type SEL and Type SK for AWG #4 and larger conductors.

2.14. MULTI-TAP CONNECTORS:

- A. Multi-tap connectors shall be insulated type
- B. Multi-tap connectors shall be rated for the conductor sizes indicated on the drawings.
- C. The connectors shall be provided for the number of conductors indicated, including any future taps shown, plus a minimum of one additional tap.
- D. Multi-tap connectors shall be equal to IlSCO Type PCT or Type PED-CP.

2.15. WATERPROOF WIRE JOINTS:

- A. Splices made below grade shall be made connectors, UL listed as waterproof, for below grade applications.
- B. Waterproof Twist On Connectors for Up to 2#6 W/1#12 tap Conductors: Single piece wire nut pre-filled with silicone sealant. Sealant shall be rated for 45-400 degrees F. Connectors shall have same insulation rating as conductors. Sizes shall be available for connecting up to 2 #6 w1#12 tap conductors. Connectors shall be UL listed as waterproof for below grade applications and equal to Ideal Buchanan B-Cap Twist and Seal Wire Connectors, King Safety Products, Tyco/Raychem GelCap SL, or equal.
- C. Waterproof Stub Splice Kit for up to #2/0 Conductors: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for feeder wire sizes #14 through #2/0 and tap wire sizes of #14 through #6. Connectors shall be UL listed as waterproof for below grade applications and equal to Tyco/Raychem GelCap SL.
- D. Waterproof In-line Splice Kit for up to #2/0 Conductors: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for wire sizes #6 through #350 kcm. Connectors shall be equal to Tyco/Raychem GTAP.
- E. Waterproof Splice Kit for Conductors above #2/0: Kit containing connector block, outer waterproof sleeve, and lubricant. Sleeve shall have same insulation rating as conductors. Kit shall be rated for wire sizes #14 through #2/0. Connectors shall be equal to Tyco/Raychem GHFC.

2.16. PLASTIC MARKING TAPE FOR MARKING UNDERGROUND CABLES AND CONDUITS:

- A. Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch.
- B. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise.
- C. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep.
- D. The tape shall be of a type specifically manufactured for marking and locating underground utilities.
- E. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion.
- F. Tape color shall be as specified in the table below and shall bear a continuous printed inscription describing the specific utility.

Red:	Electric
Orange:	Data, Telephone, Television,

2.17. FIRE STOPPING:

- A. Fire sealant shall be intumescent caulk, putty, sheet and/or wrap/strip as required to attain the proper rating.
- B. Caulk shall be equal to 3M CP25 N/S and/or S/L.
- C. Putty shall be equal to 3M Fire Barrier Moldable Putty.
- D. Sheet equal to 3M CS195.
- E. Wrap/strip equal to 3M FS195.

- F. Equal products by Dow Corning, Hilti, and Metacaulk will be accepted.
- 2.18. SPACERS FOR CONCRETE ENCASED ELECTRICAL DUCTS:**
- A. Spacers shall be interlocking high impact plastic assemblies, which provide horizontal and vertical spacing, and hold the ducts and re-bar, where applicable, in place.
 - B. The spacers shall be equal to Carlon Snap-Lok Spacers.
- 2.19. JUNCTION BOXES (THRU 4-11/16"):**
- A. Sheet Metal: To be standard type with knockouts made of hot dipped galvanized steel, By Steel City, Raco, Appleton or approved equal.
 - B. Cast: To be type FS, FD, JB, GS or SEH as required for application.
- 2.20. JUNCTION AND PULL BOXES (LARGER THAN 4-11/16"):**
- A. Shall be cast metal for all below grade exterior use and where indicated on plans. All other shall be oil tight, JIC boxes not less than 16 gauge, equal to Hoffman type "CH" boxes.
- 2.21. PULL BOXES:**
- A. Galvanized sheet metal screw-cover type with UL label as produced by Austin, B & C Metal Stamping Company, E-Box, Hoffman, Wiegmann, or approved equal.
- 2.22. JUNCTION AND TERMINAL BOXES FOR AUXILIARY SYSTEMS:**
- A. Junction boxes for auxiliary system circuiting splicing shall be formed of galvanized steel.
 - B. Boxes shall have hinged front, locking door(s).
 - C. Metal back plates shall be provided for mounting terminal strips or other devices.
 - D. Screw terminal strips shall be provided with a minimum of 25 percent spare terminals.
 - E. Boxes shall be sized to accommodate the terminal blocks and conductors, providing code required bending space.
 - F. Boxes for auxiliary systems shall be manufactured by Austin, E-Box, Hoffman, or Wiegmann.
 - G. Provide complete back boxes for all surface mounted devices. Back box shall have knockout on top and bottom as needed. Surface mounted junction boxes with devices mounted to it will not be accepted. Wiremold boxes will be accepted.
- 2.23. AUXILIARY GUTTERS (WIRING TROUGHS):**
- A. Gutters shall be of sizes shown and/or required by the NEC (whichever is larger), constructed of code gauge, galvanized sheet steel, painted ANSI 61 gray.
 - B. Gutters shall be UL listed and shall be of NEMA 3R construction in wet or damp locations or shall be as indicated on the drawings.
 - C. Gutters shall be as produced by Austin, B & C Metal Stamping Company, E-Box, Hoffman, Wiegmann, or approved equal.
- 2.24. STRUT SYSTEM FOR SUPPORT OF ELECTRICAL EQUIPMENT:**
- A. Strut shall be 1-5/8" except where heavier strut is required to support the load, for rigidity, or where specifically indicated otherwise.
 - B. Cold-formed steel, ASTM A 570 or A 446 GR A.
 - C. Stainless Steel Strut: Type 304, ASTM A 240.
 - D. Hot Dipped Galvanized Steel Strut: Zinc coated after manufacturing operations are complete, ASTM A 123 or A 153
 - E. Electro-galvanized Steel Strut: Electrolytically zinc coated, ASTM B 633 Type III SC 1.
 - F. Fittings: Same material as strut, ASTM A 575, A 576, A 36, A 635, or A 240.
 - G. Zinc Primer: As recommended by strut manufacturer.
 - H. Strut Systems shall be as manufactured by B-Line, Erico, Globe, Kindorf, MasterStrut, Power Strut, T&B SuperStrut, or Unistrut.

2.25. OUTLET BOXES:

- A. General: Except as noted, boxes shall be standard hot dipped galvanized steel at least 1-1/2" deep, of metal at least 1/16" thick; sized to accommodate devices and conductors per NEC Article 370; product of Appleton, National, Steel City, or approved equal.
- B. Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.
- C. Typical boxes (for switches, receptacles and auxiliary systems):
 - 1. All junction boxes shall be recessed within the confines of the walls unless otherwise noted. Junction boxes shall be accessible by means of a coverplate or a standard junction box cover whichever is appropriate for the installation.
 - 2. 4" square boxes ganged as required. Box volume shall be in accordance with NEC Section 370 – provide extensions as required.
 - 3. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and otherwise appropriate for surface and construction.
 - 4. Use 4-11/16" square, 2-1/8" deep boxes where more than 10 conductors enter the boxes. Provide extensions as required to provide volume per NEC.
 - 5. Where existing walls are furred out with shallow hatch channel and sheet rock then the contractor will be required to use a shallow junction as required.
 - 6. All exposed junction boxes for receptacles, communications devices, switches, and fire alarm devices shall be provided with back boxes. Do not use standard junction boxes when exposed. No exposed edges of devices plates will be allowed. No knockouts on the side of the box. Boxes shall be similar to Wiremold 500 & 700 Series.
- D. Boxes in Exposed (or Thin-Coat Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square-cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square-cut tile cover.
- E. Boxes used with Exposed Conduit: 4" square utility boxes.
- F. Exterior Boxes: Galvanized cast-metal boxes, Crouse-Hinds Type FS or FD as appropriate. Make weatherproof with gasketed covers. Equal products by Appleton, Killark, O-Z/Gedney or approved equal will be accepted.
- G. Exterior Boxes: All receptacle boxes shall be recessed unless specifically called out not to be. This includes exterior receptacles in all masonry type walls including but not limited to Pre-cast, Brick, Block, etc.
- H. Boxes used with Recessed Lighting Fixtures: Provide a 4" square box with blank cover.
- I. Boxes in Dry Wall Construction: Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi-gang devices occur).
- J. Boxes installed exposed in kitchen and dishwashing areas shall be copper free cast aluminum with gasketed cast coverplates, without lift cover, unless specifically indicated otherwise on the drawings.

2.26. CONDUCTORS AND CABLES:

- A. Power Conductors
 - 1. The ungrounded conductors (phase) and the grounded conductor (neutral) of each voltage system being installed shall be phase identified the full length of the conductor with the color characteristics manufactured in the insulation of cable from the cable manufacturer. Required color cable will then be installed for the specific voltage system as identified in these specifications.
 - 2. All conductors shall be copper with not less than 98% conductivity and with current carrying capacities per N.E.C. for 60°C. for sizes through #1 AWG and 75°C for conductors #1/0 and above.
 - 3. All conductors shall have manufacturer's name, type insulation, and conductor size imprinted on jacket at regular intervals.

4. Conductors of size #10 and smaller shall be solid copper conductors with 600-volt type THHN or THWN insulation.
5. Conductors of size #8 and larger shall be stranded copper conductors with 600-volt type THHN or THWN insulation.
6. All motor branch circuits, HVAC, and plumbing equipment shall be stranded copper conductors with 600-volt type RHH-RHW insulation.
7. All conductors installed in conduit below grade shall be rated for wet location.
8. Manufacturer: Conductors shall be products of GE, Triangle, Phelps- Dodge, Anaconda, Rome, Habirshaw, General Cable, or approved equal.
9. Fixture Wire:
 - a. Conductors feeding into fixtures, other than fluorescent fixtures, of 300 watts or less shall be #14, 200°C., type SF-2, for fixtures of more than 300 watts #12, 200 °C., type SF-2 shall be used.
 - b. Conductors pulled through fluorescent fixtures shall have Type TFN or TFFN fixture wire, rated 90oC.
 - c. Conductors shall be by Dodge, Anaconda, Rome General Cable or Southwire.
- B. Control and Signal Wire: Conductor type TFF, minimum size #16 copper and fully color-coded, shall be used. Conductors shall be by Anaconda, Houston Wire & Cable, General Cable, Phelps Dodge, Rome, or Southwire.

2.27. WIRING DEVICES:

- A. General: Manufacturer's and catalog numbers listed are used to establish style, type and quality. Unless otherwise indicated on drawings, all wiring devices shall be UL listed, side-wired specification grade.
- B. Manufacturers: Equal devices by Hubbell, Leviton, Eaton and P & S will be accepted. All devices shall have plaster ears.
- C. Wall switches: 120/277V, 20A, AC, flush enclosed, quiet type switches with thermoplastic body and polycarbonate toggles. Switches shall meet Federal Specification WS-896. Switches shall be, Hubbell 1200 series, Leviton 1200 series, Eaton AH1200 series or P & S PS20AC series single pole, 2-pole, 3-way, or 4-way as required.
- D. Duplex receptacles (general purpose): 125V/20A flush duplex back and side wired hard use specification grade receptacles, NEMA 5-20R configuration, with nylon face and body, grounding terminal and break-off fins for converting to 2-circuit use. Receptacles shall meet Federal Specification WC-596. Color to match wall switches. Equal to P & S 5362, Hubbell CR20, Eaton 5362 or Leviton 5362.
- E. Tamper Resistant Duplex receptacles, 125V/20A flush duplex, hospital grade, tamper resistant receptacles, NEMA 5-20R configuration, with nylon face and body, grounding terminal. Receptacles shall meet Federal Specification WC-596. Color to match wall switches. Equal to P & S TR62-H, Eaton TR8300 or Hubbell HBL8300SGDuplex combination 125/250-volt receptacles: receptacles shall be 20 amp, combination 125 volt (NEMA 5-20R)/250-volt (NEMA 6-20R) grounding receptacles.
- F. Ground Fault Circuit Interrupt Receptacles: 125V/20-amp ground fault circuit interrupting receptacle for personnel protection, NEMA 5-20R configuration, Equal to Hubbell #GF5362, Leviton #6599, Eaton SGF20 or P & S 2091. Each GFCI symbol on drawing indicates a GFCI type receptacle. Do not through-wire non-GFCI receptacles from GFCI receptacles where ground fault protection is required. All exterior receptacles shall be ground fault interrupting type with weatherproof coverplates.
- G. Faceless Ground Fault Circuit Interrupter: 125V, 20-amp ground fault circuit interrupter UL listed for personnel protection, equal to Hubbell GFR5350 Series, Leviton 6490, Eaton SGFD20 or Pass & Seymour Series 2081.
- H. Single Receptacles: Flush Bakelite receptacles with side wiring and grounding terminal, voltage, amperage, and configuration as required for circuit indicated.
- I. Each single or multi outlet receptacle, other than straight blade, 15 or 20 amp, 120 volts, NEMA 5-15R or NEMA 5-20R, shall be provided with matching cord plugs.

- J. Multioutlet Assemblies, Strip outlets, 15 amp, 125V, grounded, outlets on 6" centers, equal to Wiremold V20GBx06. Where x = length indicated on the drawings.
- K. Plugs for kitchen equipment to be plugged into wall mounted straight blade receptacles shall be angled type.
- L. Wiring devices shall be of color as directed by Architect. Devices must be available in ivory, brown, black, white, and gray. Devices connected to the emergency generator shall be red in color.
- M. All receptacles shall be tamper-proof type receptacles where required by the National Electrical Code.

2.28. DEVICE PLATES:

- A. Type appropriate for the associated wiring device, equal to Sierra Stainless Steel Smoothline. Device plates shall be of color as directed by Architect. Devices must be available in ivory, brown, black, white, and stainless steel. Provide single plate of proper gang where more than one device occurs (do not gang dimmers with rocker switches).
- B. Damp Location: 20 amp, 125 and 250-volt receptacles - Covers shall be weatherproof when plugs are not installed, provide cast aluminum weatherproof coverplates with single lift cover and gasket equal to Hubbell CWP26H.
- C. Wet Locations, 20 amp, 125 and 250-volt receptacles: Covers shall be weatherproof In-Use covers, rated NEMA 3R when in use and shall be constructed of cast aluminum with sealing gasket. Covers shall be equal to products by Hubbell, Leviton, Steel City, T & B, and Taymac.
- D. Coverplates for exposed cast aluminum boxes in kitchen and dishwashing areas shall be cast coverplates, without lift cover, unless specifically indicated otherwise on the drawings.
- E. Color: Wiring device cover plates shall be of color as indicated on drawings or directed by Architect. Devices must be available in ivory, brown, black, white, gray, and stainless steel.
- F. Jumbo and Mini-Jumbo plates will not be accepted.

2.29. OCCUPANCY SENSORS AND ACCESSORIES FOR LIGHTING CONTROL:

- A. Occupancy sensors shall be totally passive in nature, in that the sensors shall not emit or interfere with any other electronic device, or human characteristic. Sensors shall be dual technology, i.e.: Passive Infrared (PIR) and Microphonic.
- B. PIR shall initiate an "on" condition and the PIR or microphones shall maintain the load "on".
- C. Upon detection of human activity by the detector the lights shall come on and a time delay shall be initiated to maintain the lights on for a pre-set time period. The time delay shall be factory set and field adjustable from 30 seconds to 20 minutes.
- D. All devices shall be factory warranted for 5 years.
- E. All sensors shall be low voltage, 12 to 24 volts and shall work in conjunction with remote power packs.
- F. Occupancy sensors shall be as shown on drawings.

2.30. GROUNDING:

- A. Ground Rods shall be 3/4" x 10' copperclad steel.
- B. All grounding conductors shall be copper.

2.31. LIGHTING FIXTURES

- A. General:
 - 1. All Lighting Fixtures shall be UL labeled.
 - 2. Fixtures installed in fire rated ceilings or ceiling assemblies shall be rated for installation in fire rated ceilings.
 - 3. Furnish fixtures complete with lamps, ballasts and internal wiring factory installed.
 - 4. Fixtures shall be furnished as specified herein and as shown on the fixture schedule on the plans. Catalog numbers shown are for basic units; furnish all fixtures complete with

- flexible connections, trim, plaster frames, and all other appurtenances necessary to the installation.
5. Substitutions: Reference to a specific manufacturer's product is made to establish a standard of quality and design, and to give a general description of the basic type desired. Equal products by the listed manufacturers will be accepted subject to the Engineer's approval.
 6. It shall be the responsibility of the contractor to verify the exact type ceiling, type fixture mounting and trim, and recessing depth of all recessed fixtures prior to purchasing any fixtures.
 7. Stems on stem mounted fixtures shall be approved ball aligner type, swivel 30 degrees from vertical with swivel below canopy. Paint stems the same color as the fixture trim. Stems in unfinished areas may be unpainted conduit.
 8. High and low bay fixtures shall be equipped with safety chains. Every suspended fixture in Gymnasium shall have safety chains.
 9. Fixtures installed on the exterior of buildings, on poles, or on pedestals shall be rated for wet location installation.
 10. All lighting fixtures installed in gymnasiums, hangars or similar use areas shall be provided with wire guard.
- B. Emergency and Exit lighting Fixtures shall be equipped with a Self-testing module which shall perform the following functions:
1. Continuous monitoring of charger operation and battery voltage with visual indication of normal operation and of malfunction.
 2. Monthly discharge cycling of battery with monitoring of transfer circuit function, battery capacity and emergency lamp operation with visual indication of malfunction. The battery capacity test may be conducted by using a synthetic load.
 3. Manual test switch to simulate a discharge test cycle.
 4. Modules shall have low voltage battery disconnect (LVD) and brownout protection circuit.
 5. All lighting fixtures and exit signs shown as emergency on drawings shall be provided with a minimum 1100 lumen emergency battery ballast capable of 90 minutes of illumination. No exceptions.
- C. Lamps: Type and Lumen Output as scheduled.
1. LED bulb shape shall comply with ANSI C79.1. Lamp base shall comply with ANSI C81.61.
 2. Minimum CRI of LED lamps shall be 80 with a color temperature as shown on drawings.
 3. Rated life of all LED lamping shall be a minimum of 50,000 hours failure to 75% of lamp output.
 4. LED lamping shall be capable of dimming from 100% to 0%.

2.32. PANELBOARDS:

- A. General: All panelboards shall be dead front type manufactured and installed in accordance with UL and NEMA standards and shall carry a UL label. Ampacity, service voltage, and configuration shall be as indicated on drawings. Panelboards shall be clearly marked with ampacity, voltage, and maximum short current ratings.
- B. Manufacturer: Panelboards shall be as manufactured by Cutler-Hammer, Square D, or Siemens.
- C. Enclosure:
 1. Panelboard enclosures shall be as indicated on drawings.
 2. Unless otherwise indicated, all boxes shall be constructed of galvanized (or equivalent rust-resistant) sheet steel with hinged front trim.
 3. Fronts shall be door in door with two lockable latches to open door, lock, and latch. All panelboard locks shall be keyed alike. Piano hinges with screw latches will not be permitted.
 4. Fronts shall be finished with gray baked enamel over a rust-inhibiting phosphatized coating.

5. All dual section panels shall be equal in size. Sub-Feed circuit breakers will not be allowed to feed second section.
 6. Sub-Feed circuit breakers feeding additional panels or equipment shall be branch mounted.
 7. Provide permanent numbering of the panelboards. Stickers are not considered permanent.
 8. Any panelboard schedule that indicates more than 42 circuits shall be provided in two equally sized panelboards.
 9. Main circuit breakers shall be centered mounted. Main breaker cannot be mounted on buss bars with other circuit breakers.
- D. Buss Assembly:
1. Bussing shall be copper.
 2. The buss assembly A.I.C. shall be rated as indicated on drawings. Ratings shall be established by heat rise tests, in accordance with UL Standard 67.
 3. All bussing shall accept bolt on circuit breakers.
 4. Current carrying parts of all bussing shall be plated. In lighting and receptacle panels, bussing shall be designed for connection to the branch circuit breakers in the phase sequence format. Distribution panelboards shall be fully bussed.
 5. Ground bars shall be provided in all panelboards.
 6. Neutral bar shall be fully sized with lugs suitable for incoming and outgoing conductors.
 7. Provide insulated ground buss where indicated on the panelboard schedules.
- E. Circuit Breakers:
1. Circuit breakers shall be quick-make, quick-break, thermal magnetic, molded case, bolt on type.
 2. Circuit Breakers shall be numbered and arranged as indicated on the panelboard schedules and/or single line wiring diagrams. Numbers shall be permanently attached to trim.
 3. SWD Circuit Breakers: Single pole circuit breakers rated 15 and 20 amperes and intended to switch 277 volts or less fluorescent lighting loads shall be UL rated for switching duty and shall be marked "SWD".
 4. HACR Circuit Breakers: Circuit breakers 60 amperes or below, 240 volts, 1-, 2-, or 3-pole, intended to protect multi-motor and combination-load installations involved in heating, air conditioning, and refrigerating equipment shall be UL listed as HACR type and shall be marked "Listed HACR Type."
 5. Circuit breakers serving fire alarm systems, dedicated emergency/exit lighting circuits, and area of rescue communications systems shall be equipped with a screw-on, mechanical handle blocking device which locks the circuit breaker in the "ON" position.
 6. Circuit breakers serving circuits in residential bedrooms shall be Arc Fault Interrupting(AFI) type circuit breakers and shall be UL 1699 listed.
- F. Directories:
1. Each panelboard shall be equipped with a metal directory frame with a clear cover welded to the inside of the door.
- G. Equipment Short Circuit Rating: Short Circuit Interrupting Ratings shall be as indicated on the plans and schedules. Unless specifically indicated otherwise all rating are "Fully Rated" capacities. Where no rating is given, the contractor shall verify the available short current with the serving utility and provide equipment rated accordingly.
- H. Lighting panelboard cans shall be a maximum of 20" wide and 5 3/4" deep. Cans of multi-section panelboards shall be the same size.
- I. Provide nameplate as called out on drawings.
- J. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.
- K. All flush mounted panel shall be provided with six (6) 3/4" conduit stubbed up above accessible ceiling.

2.33. DISTRIBUTION PANELBOARDS:

- A. Furnish and install distribution and power panelboards as indicated in the panelboard schedule(s) or single line wiring diagrams and where shown on the plans.
- B. Panelboards shall be dead front, safety type equipped with thermal magnetic, molded case circuit breakers with trip ratings as indicated on the schedule(s).
- C. Panelboard bussing shall be copper.
- D. Panelboard buss structure and main lugs or main breaker(s) shall have the fault current ratings as indicated on the drawings. Ratings shall be established by heat rise tests conducted according to UL Standard UL67.
- E. Circuit breakers shall be equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other.
- F. Main circuit breakers shall be centered mounted. Main breaker cannot be mounted on buss bars with other circuit breakers.
- G. An engraved phenolic label shall be permanently attached to the front of the panelboard adjacent to each circuit breaker identifying the load served by the circuit breaker.
- H. Automatic tripping shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is automatically tripped.
- I. Provisions for additional breakers shall be such that no additional connectors or hardware will be required to add breakers.
- J. The panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel shall be as specified in UL Standards. End walls shall be removable. The size of wiring gutters shall be in accordance with the National Electrical Code, NEMA, and UL Standards for panelboards.
- K. Cabinets shall be equipped with four-piece fronts.
- L. The panelboard interior assembly shall be dead front with panelboard front removed.
- M. Main lugs or main breaker shall be barriered on live sides.
- N. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the buss structure opposite the mains shall be barriered.
- O. Circuit breakers serving Fire Alarm Systems, Security Systems, and/or Emergency/Exit lights shall be equipped with mechanical, screw-on type, locking devices. These devices shall not be padlock type devices.
- P. Panelboards shall be listed by Underwriters' Laboratories and to bear UL label. Panelboards shall be rated for use as Service Entrance Equipment where required by the National Electrical Code. Panelboards shall be by Cutler-Hammer, Square D, or Siemens.
- Q. Provide nameplate as called out on drawings.
- R. All circuit breakers 1200-amp and up shall comply with NEC Article 240.87 Arc Energy Reduction.
- S. All flush mounted panel shall be provided with six (6) ¾" conduit stubbed up above accessible ceiling.
- T. All service entrance main circuit breakers shall be 100% rated.

2.34. LIGHTING CONTROL SYSTEM:

- A. System description
 - 1. Install a lighting control system consisting of control panel(s), control switches, photocell and other controlling devices connected by low voltage and network wiring. The general operation of lighting and controlled loads shall include:
 - a. Interior lighting – manual switch control on/off with automatic time scheduled shut off for each space
 - b. Timed on/off loads – time on, time off
 - e. Exterior lighting – photocell or astronomic on/time off, time on/photocell or astronomic off.
 - f. Exterior security lighting – photocell or astronomic on, photocell or astronomic off.

- g. Requirements are indicated elsewhere in the specifications for work including, but not limited to, raceways and electrical boxes and fitting required for installation of control equipment and wiring.
- B. Submittals
- 1. Shop Drawings: Submit dimensional drawings of all lighting control system components and accessories.
 - 2. One Line Diagram: Submit a one-line diagram of the system configuration proposed if it differs from that illustrated in the riser diagram included in the contract drawings.
 - 3. Complete drawings: Submit shop drawings showing all components including, but not limited to, lighting control panels, relays, contactors, photocells, switches, occupancy sensors, and interconnecting control wiring. Submittals will be rejected without this.
- C. Manufacturers
- 1. The basis of the specified system is the Nexlight System. Any other system wishing to be considered must submit descriptive information 10 days prior to bid. Prior approval does not guarantee final approval by the Engineer.
 - 2. Manufacturer shall have a factory-trained technician within 150 miles of job site. Include in the bid at least three trips by the factory trained technician to the job site. One visit shall be for the beginning of construction. Second visit shall be to insure lighting control system is being installed correctly. The third site visit shall be for final programming and factory training for the Owner. Coordinate with owner representatives for final programming requirements. Coordinate final training with trainees, contractor, and engineer prior to site visit. Manufacturer shall provide additional site visits as needed to get their system working correctly at no additional cost to owner. Bid accordingly.
- D. Modular Relay Panels shall be UL listed and consist of the following:
- 1. Can: NEMA 1 enclosure that can accept an interior sized to accept up to 24 or 48 mechanically latching relays.
 - 2. Power Supply: Transformer assembly with two 40VA transformers with separate secondaries. Transformers include internal overcurrent protection with automatic reset and metal oxide varistor protection against power line spikes. Single unit provides either 115 or 277 VAC as required, 60 Hz +/- 10%.
 - 4. Cover: Surface or Flush as required, with captive screws in a hinged, lockable configuration.
 - 5. Interior: Bracket and intelligence board backplane with pre-mounted relays. Interiors shall be provided with up to 24 or 48 installed and tested relays.
 - 6. Panel shall be provided with an integral DIN rail mounting bar for easy installation of other system components.
 - 7. Features
 - a. Relays shall be individual relays with 20 Amp load contacts for ballast (including HID, magnetic or electronic type ballasts), tungsten, and general use, and shall be rated for 200,000 operations at full load. Relays shall use quick connectors and be individually replaceable to facilitate ease of use.
 - b. The lighting control panel shall be able to house multi-pole contactors for control of multi-circuit or multi-phase loads. Contactors shall be rated for 20 Amps tungsten, 30 Amps for ballast or general use and shall be compact, rail mount style for easy installation and use.
 - c. Lighting control panels shall provide a stagger up delay, override push buttons, pilot light outputs, and LED status light indicators for each relay.
 - d. For every 8 relays there shall be 8 standard, 2 master, and 1 after-hour switch inputs. Standard switch inputs shall have a one-for-one default assignment to relays. Master inputs shall be unassigned.
 - e. Switch inputs shall be self-configuring and shall not require programming to accept momentary on/ momentary off, push button (cycling), maintained, or 3 to 24VDC signal. Using any of these switch types shall not sacrifice the number of switch inputs available. Switch inputs shall allow switch wiring distances of up to 5000 feet on 20-gauge wire.

- f. After-hour shut off control shall provide a true override time with a warning blink five minutes prior to shutting the relay output off. Any relay output's impending shut off will be canceled and the override period re-initialized through the operation of an assigned switch input. The override function shall be performed by the local control switch or telephone switch module and shall not require turning lights off and back on to reset the override time period regardless of the switch type used. The system shall provide the full after-hour override time period beginning from the moment of switch ON operation. After-hour shut off shall not be accomplished by repetitively sweeping relay outputs off by time schedule.
- E. ETHERNET MULTI-USER CONNECTIVITY – Automation Appliance (AA-BASE)
- 1. System Description
 - a. A network appliance will provide multi-user, simultaneous access to the lighting system using standard TCP/IP and Web-browser software for user interface
 - b. The network appliance will include Ethernet, Serial ports and optional 56K BAUD internal modem.
- G. Features
- a. Multiple users will be able to simultaneously connect to the IP address of the AA-BASE.
 - b. Users may be connected via an Intranet, or Internet depending upon network security limitations.
- F. System Clock
- a. The system time clock shall be installed in the main or central panel of a multiple panel system or in each panel when individual panel time control is desired. The system clock shall provide time-based control with eight-year time back-up, non-volatile memory program storage, automatic daylight savings adjustment, selectable 12/24-hour time formats, and selectable date formats. All clock programming shall be accessible from the clock front display/keypad or via the Lighting Control Software.
- G. Features
- 1. Control of 32 channels shall be available on the clock for control of any lighting control panel or relay pack connected on the network. Provide status and manual on/off control of each channel from the front display and keypad.
 - 2. Schedules shall be assigned to any combination of days of the week and/or 3 holiday day types. Other scheduling features shall include:
 - a. Temporary schedules – schedules that execute on an assigned day then automatically delete themselves from memory.
 - b. Duration on/off – turn channels on or off for a time period adjustable from 1 second to 18 hours.
 - c. Repeating schedules – repeat a schedule at intervals that are adjustable from 5 minutes to 10 hours.
 - 3. 32 perpetual holidays assigned to any one of three holiday day schedules and continuing for 1 to 120 days. Holiday dates shall be specific day/month/year, or perpetual dates including day/month/all years or day of the week in a given month every year, or self-calculating Easter Sunday.
 - 4. Astronomic capability for calculating sunrise and sunset based on time, latitude, longitude, and time zones. All scheduled astronomic/time operations shall be interlocked so loads are not turned on when astronomic off times are earlier than scheduled on times or astronomic on times are later than scheduled off times. Each schedule shall have an independent astronomic offset of ± 120 minutes.
 - 5. Following a power outage, the system clock shall run a start-up process that executes schedules that would have been missed during the power outage.
- H. Lighting Control System Software
- 1. Lighting control system software that is Windows and PC based shall be provided for system configuration and operation. The software shall have on-line programming and off-line programming for later upload/download. PC and software are not required to remain on-line with the system for normal operation.

3. The software shall have password protection (which can be enabled/disabled) and four functional access levels and shall support multiple site operation by either direct connect to the network or via phone line modem dial-in.
 4. Lighting control system software shall be capable of linking switch inputs to relay outputs, retrieving links, viewing relay output status, controlling relay outputs, simulating the operation of switch inputs, setting device addresses, and assigning switch input and relay output personality attributes.
 5. System clock operation from the software shall provide programming of schedules, programming of holidays, setting clock preferences, and controlling clock channels. Multiple clock schedule profiles shall be available allowing easy programming of new clock schedules for changing shifts, special schedules or events.
 6. In the software, system devices, switch inputs, relay outputs, controlled circuits and system clock channels shall have alphanumeric descriptor fields providing user defined labels for easy identification.
 7. Reports from the software shall generate complete device listings including all switch inputs and outputs, switch input to relay output linking report, system clock scheduling report, system clock holiday scheduling report, and control panel schedule reports. All reports shall be easily printed in a readable format.
- I. Ethernet Router
1. Ethernet tunneling router that provides the capability of the lighting control system to communicate over a standard TCP/IP Ethernet system. This system may be a Local Area Network or Wide Area Network that supports standard TCP/IP communication.

2.35. SAFETY SWITCHES:

- A. Furnish and install safety switches as indicated on the drawings.
- B. Switches installed on 277/480 volts systems shall be rated for 600 volts and those installed on 120/208 volt or 120/240-volt systems shall be rated for 240 volts.
- C. Switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratory listed. Safety switches shall be Cutler Hammer, Siemens, or Square D.
- D. General Duty disconnects will not be accepted.
- E. Enclosures for switches mounted outdoors shall be NEMA 3R or as indicated on the plans.
- F. Enclosures for switches installed in kitchen and dishwashing areas shall be NEMA 4X stainless steel or as indicated on the plans.
- G. All safety switches for equipment with remote controls shall be equipped with a control circuit disconnect interlock.
- H. Switches shall be lockable in the "ON" and in the "OFF" positions.
- I. Provide each disconnect with a nameplate that indicates equipment name, voltage/phase, and feed from location.
- J. Provide keyed brass locks on all disconnects that is located on the exterior of the building or in any area that is accessible to children or the public. All the brass locks shall be keyed the same and turn over 10 sets of keys to the owner at substantial completion.
- K. Disconnect locations shown on drawings is diagrammatically shown. Disconnects shall be coordinated with other trades and placed in the optimal locations to serve equipment and shall be installed in the least obtrusive location. Disconnects will have to be moved at the cost of the contractor when there is conflicts with NEC clearances, access to space, or servicing of equipment. Architect/Engineer will have final judgment of proper location.

2.36. MANUAL MOTOR STARTERS (TUMBLER SWITCH TYPE WITH OVERLOAD PROTECTION):

- A. Starting and thermal overload protection for single phase motors 1/8 Hp to 1 HP shall be provided by manual motor starters with overload units rated as required by the specific motor to be served.
- B. Switches installed for site disconnect switches shall be equipped with padlocking provisions.

- C. Starters shall be by Cutler Hammer, General Electric, or Siemens with NEMA Type 1 enclosure or NEMA Type 3R enclosure where installed outdoors.

2.37. TRANSIENT VOLTAGE SURGE PROTECTORS (SURGE PROTECTIVE DEVICES):

- A. Provide transient voltage surge protectors (Surge Protective Devices) where indicated on the plans. At a minimum provide on all service entrance panelboards/switchboards and any panelboard/switchboards on the secondary side of a dry-type transformer.
- B. Service Entrance Panelboards and at Subpanel Protectors shall be listed and labeled and components recognized in accordance with UL 1283 and UL 1449 Second Edition, including highest fault current of Section 37.3.
- C. All devices shall meet or exceed the following:
 - 1. NEMA LS 1-1992.
 - 2. Minimum surge current capability, single pulse rated, per mode:
 - a. Service Entrance – 100 kA (200 kA per phase)
 - g. Distribution and branch panelboards – 80 kA (160 kA per phase)
 - 3. UL 1449, Second Edition, Listed and Labeled, and Recognized Component Suppressed Voltage Ratings shall not exceed (1.2x50 μ s, 6kV open circuit and 8x20 μ s, 500A short circuit test wave forms at end of 6" lead):

Voltage	L-N	L-G	N-G	L-L
208Y/120v	400	400	330	700
480Y/277V	800	800	800	1500
 - 4. Testing shall be done at the end of 6" leads with the complete unit including any fuses and all other components making up the unit.
- D. The devices shall have a minimum EMI/RFI filtering of –50dB at 100kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.
- E. Devices shall utilize MOV's of 25 mm diameter or larger, shall have pilot lights visible on the outside of the enclosure to indicate device operating condition, and shall provide contacts for remote monitoring of device condition.
- F. Devices shall be modular in design with individual module fusing and thermal protection.
- G. Devices shall incorporate visual alarm signals that indicate the failure of a single MOV and total loss of protection.
- H. Wye connected devices shall provide L-L, L-N, L-G, and N-G surge diversion with L-N/L-G bonded at service entrance devices. Delta connected devices shall provide L-L and L-G protection.
- I. Data Line Surge Protectors: Data Line Surge Protectors shall be UL 497B listed and labeled. The units shall be heavy duty devices utilizing a combination of silicone diodes and gas tube technology to provide surge protection.
- J. All devices shall have a minimum warranty period of five years, incorporating unlimited replacement of suppressor parts if they fail during the warranty period.
- K. Transient voltage surge suppressors shall be manufactured by AC Data Systems, Advanced Protection Technologies, Current Technologies, Cutler-Hammer, General Electric, Joslyn, Liebert, or MCG.

2.38. SECONDARY SURGE ARRESTERS:

- A. Secondary surge arresters shall be UL listed under UL Classification (Lightning Protection) Surge Arresters (OWHX).
- B. Surge arresters shall be rated at same voltage and phase configuration as service.
- C. Arresters shall be equal to Cooper Power Systems ASZH Series, Cutler-Hammer, GE Tranquell, Joslyn Electronic Systems, Leviton models as required to match the voltage of the system served.

2.39. FUSES:

- A. General: Fuses shall be UL listed time delay types with a minimum interrupting rating of 100,000 amps symmetrical.
- B. 200 amps and below: Provide Class RK-5 current limiting, time delay, rejection type as manufactured by Busman Manufacturing, Ferraz Shawmut, or Littlefuse.
- C. 201 to 600 amps: Class RK-1, current limiting, time delay, rejection type as manufactured by Bussman, Ferraz Shawmut, or Littlefuse.
- D. Above 600 amps: Class L current limiting, time delay, as manufactured by Busman Manufacturing, Ferraz Shawmut, or Littlefuse.

2.40. DRY TYPE TRANSFORMERS:

- A. Manufacturer: Transformers shall be as manufactured by Cutler-Hammer, GE, Square D, or Siemens.
- B. General: Transformers shall be constructed in conformance with IEEE, NEMA and ANSI standards.
- C. Transformers shall be dry type with copper windings, rated as scheduled on drawings.
- D. Transformers rated at 15 KVA and below shall be Class 185 (115 degree Celsius rise); transformers rated above 15 KVA and above shall be Class 200 (150 degree Celsius rise).
- E. Transformers shall have ventilated code gauge steel enclosure. Enclosures shall be for indoor installation unless indicated otherwise
- F. Units shall be equipped with four (4) 2-1/2% full capacity taps, two above and two below rated primary voltage.
- G. Core and coils shall be mounted on vibration pads and sound level of enclosed units shall be in conformance with NEMA standards.

2.41. LABELING:

- A. Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, switch, and device.
- B. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic 0.125-inch thick, white with black center core.
- C. Provide red laminated plastic label with white center core where indicated.
- D. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core.
- E. Minimum size of nameplates shall be one by 2.5 inches.
- F. Lettering shall be a minimum of 0.25-inch high normal block style.
- G. See Panelboard details for proper labeling of all panelboards.

2.42. PHOTOCELLS, TIME SWITCHES AND CONTACTORS:

- A. Photocells: Units shall have 1" diameter, hermetically sealed, cadmium sulfide sensing cell with 3-prong NEMA locking plug, rated for wet locations. Units shall have built-in time delay. Units shall be equal to Tork 5231 of correct voltage to match load or use with matching receptacle equal to Tork 2421.
- B. Time switches:
 - 1. Unless otherwise indicated on drawings, time switches shall be 24-hour electromechanical type having synchronous motor drive with two single pole double throw contacts rated 20 amps minimum.
 - 2. Unit shall have spring back up, with automatic rewind, capable of providing 16 hours minimum of reserve power upon electric power failure.
 - 3. Units shall be furnished in an enclosure, NEMA 1 indoor and NEMA 3 outdoors. Enclosures shall be flush mount unless otherwise indicated on drawings.
 - 4. Units shall be Tork 7120L, or equal by Paragon or Sangamo.

5. Time switch(es) shall be digital, seven day format, two channel time switches with 9v lithium battery 30 day back-up and with metal indoor enclosure. The controllers shall be equal to Tork #DW200A-Y.
- C. Contactors: Units shall be electrically held or electrically operated mechanically held, as indicated on drawings, and shall be recommended by manufacturer for type of load served.
- D. Contacts shall double-break type of same ampere rating as line side circuit wiring.
- E. Contacts shall be field-convertible to normally open or normally closed.
- F. Contactor coils shall be encapsulated. Electrically held contactors shall have continuously rated coils. Mechanically held contactors shall be equipped with coil-clearing contacts to energize coils only when switching.
- G. Units shall be furnished in an enclosure, NEMA 1 indoor and NEMA 3 outdoors.
- H. Units shall be equal to GE CR460 series in NEMA 1 or NEMA 3R enclosure as indicated.

2.43. FIRE ALARM SYSTEM (ADDRESSABLE):

- A. General: The contractor shall furnish and install a complete power limited automatic and manual fire alarm system, as specified herein and indicated on the drawings. The system shall include a central control panel, power supply, signal initiating devices, audible and visual alarm devices, provisions for connection of remote monitoring, a wiring system, and all necessary devices required to provide a complete operating system. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 and meet all requirements of the local authorities having jurisdiction. The Underwriter's Laboratories, Incorporated, or approved by the Factory Mutual Laboratories shall list all equipment and devices. The equipment shall be EST, FCI or Notifier. No deviation will be considered unless submittals are received and approved in writing, not less than ten days prior to bid date.
- B. Fire Alarm Document Box: The contractor shall furnish and install a fire alarm document enclosure as mandated by NFPA 72 Chapter 7.7.2.1. The system records documents box shall be constructed of 18 gauge cold rolled steel. It shall have a red powder coat epoxy finish. The cover shall be permanently screened with 1" high lettering and read "FIRE ALARM DOCUMENTS" with white indelible ink. The access door shall be locked with a ¾" barrel lock which is keyed the same as the manufacturer's fire alarm panel. The enclosure shall supply 4 mounting holes to securely fasten to the wall. Inside the enclosure will accommodate standard 8.5" x 11" manuals and loose document records that may be placed in a three-ring binder. All documents & software will be protected within the enclosure. A legend sheet will be permanently attached to the door for system required documentation, key contacts, and system information. The fire alarm document will have securely mounted inside the enclosure a minimum of 4 Gigabyte digital flash memory drive with a standard USB type B connector for uploading and downloading electronic information. The drive shall not be accessible without tools to any person who gains access to the enclosure. The enclosure shall also provide 2 Key ring holders with a location to mount standard business type cards for key contact personnel. The password to the fire alarm programming shall be provided to the owner in the fire alarm document box. The password must be provided, fire alarm contractors that refuse to give password will not be accepted. Contractor will be responsible for replacing the entire fire alarm system at their cost and cost of delaying the project if password is not provided.
- C. Control Panel: The control panel shall be an addressable type panel capable of handling up to 256 devices, with 60-hour minimum standby battery. The panel shall provide for the connection of alarm circuits as indicated and shall include the following features.
 1. The fire alarm panel shall detect the operation of any initiating device, indicate by annunciator lamps the area of the alarm condition, and operate all alarm auxiliary devices.
 2. A pilot light shall normally be on, indicating that the system is receiving power from the building service supply. A failure of the building service supply shall cause the lights to go out.
 3. A trouble light and trouble buzzer, operating together, shall signal any trouble condition. Failure of the building service supply, disarrangement in the system wiring, or alarm

- condition shall cause that trouble light to come on and the trouble buzzer to sound. A self restoring silencing switch shall be provided to silence the trouble buzzer, which shall be arranged so the trouble light will remain on until the system is restored to normal.
4. All notification signals shall be automatically locked in at the control panel until the operating device is returned to its normal condition, and the panel is manually reset. A switch shall be provided on the control panel for silencing the notification devices. The manual reset switch and the alarm-silencing switch shall be of the self-restoring type, which cannot be left in the abnormal position.
 5. The control panel shall provide relay contacts, of quantity as shown on the drawings, for control of heating, ventilation and air conditioning equipment. Such contacts shall be connected to air conditioning equipment, as indicated on drawings, for shutdown of individual units. Unit shutdown shall be initiated by duct-mounted smoke detectors unless otherwise indicated. Operation of any initiating device shall open all control contacts and release all mechanically held doors.
 6. The control panel shall be equipped with a front mounted Drill switch.
 7. Metal oxide varistors (MOV's) shall be provided on the system power supply and the municipal connection circuit to provide transient suppression protection to the control panel.
 8. Power Supply: The power supply shall be 24 Volt DC, filtered and regulated, and shall provide sufficient power for all system functions. The fire alarm system main power supply shall operate at 120 Volt AC obtained from the building service. The 120-volt AC main power shall be converted to low voltage direct current for system operation. The system shall operate on 24 volts DC with trickle charged batteries provided as an emergency source of supply for operating the system in the event of interruption of main power. A changeover relay in the control panel shall transfer to standby power automatically upon main power failure and automatically reconnect to main power upon restoration.
- D. Manual Stations: Manual Fire alarm stations shall be an addressable double acting, semi-flush mounted type. Stations with two sets of contacts will not be acceptable.
 - E. Smoke Detectors: Smoke detectors shall be addressable photoelectric type with base.
 - F. Heat Detectors: Addressable 135 degree/rate of rise type with base.
 - G. Duct Mounted Smoke Detectors: Duct detectors shall be addressable photoelectric type with sampling tube.
 - H. Contractor shall be responsible for coordinating prior to bid with mechanical drawings to confirm all duct mounted smoke detector locations and quantities. Contractor shall include in their base bid price the cost of all additional duct mounted smoke detectors and circuitry needed for locations.
 - I. Duct Detector Remote Test Station: Test stations shall be keyed with indicator light.
 - J. Audible/Visual Notification Devices: Audible/visual notification devices shall be four wire, horn/strobe units capable of 90 dB audible output, 100 candela-second output, shall be ADA compliant. Devices using incandescent lamps will not be acceptable.
 - K. Visual Notification Devices: Visual notification devices shall be strobe units capable of 100 candela-second visual output, shall be ADA compliant. Devices using incandescent lamps will not be acceptable.
 - L. Voice Control Panel: The Voice Control Panel shall play a digitally recorded message or microphone input for evacuation instructions. The unit shall be installed next to the FACP, shall be equipped with emergency battery power, and shall provide a minimum of 75 watts of amplification.
 - M. Remote Microphone Panel: Remote Microphone Panels shall have a keyswitch control and shall be supervised.
 - N. Remote Amplifier: Remote amplifiers shall be 120 watt with battery backup.
 - O. Speaker/Visual Notification Devices: Speaker/Visual Notification devices shall be semi-flush, wall mounted, combination strobe/speaker assemblies with a minimum strobe output of 100

candella-second equal to Notifier #E70-24110W-FR for wall installation or Notifier #E70-W for speaker only ceiling installations.

- P. Interface Relay:
 - 1. Provide addressable control modules equal to Notifier #CMX-2 or interface relays equal to Notifier #MR-101/CR as required for interface of the Fire Alarm System with HVAC shut down, door holders, kitchen hood fire suppression system, and fan shut down, and any other locations required for proper interface and operation of systems.
 - 2. A control module or interface relay shall be provided for each duct mounted smoke detector and shall be the point of interface between the Fire Alarm System and the HVAC Control System.
 - 3. Contacts shall be rated for 10 A at 120 V.
- Q. Flow and Tamper switch Monitoring: Individual Addressable Module.
- R. Elevator Monitor and Interface: Individual Addressable Module.
- S. Door Holders: Door Holders: Door holders shall be magnetic semi-recessed wall-mounted type, or where indicated to be floor mounted.
- T. **UL Fire Listed Cellular Communicator: Terminals and other necessary facilities shall be provided in the control panel to permit automatic transmission of trouble and alarm signals over a UL listed cellular communicator to the fire, police, or other continuously manned facility, so designated for response to fire emergency. Provide 3-years of cellular and monitoring for the fire alarm system in the base bid from the date of substantial completion.**
- U. Annunciator Panel: Provide and install an annunciator that provides an audible and visual indication of an alarm or trouble condition for each zone, an alarm silence switch, and a key operated test and reset switch.
- V. Auxiliary Remote Power Supplies/Notification Appliance Circuit Extenders (NAC Panels):
 - 1. Provide auxiliary power supplies and/or NAC Panels where required for notification devices, door holders, annunciators, or for other devices requiring supplemental power.
 - 2. Remote power supplies shall include a filtered and regulated 24 VDC output, provisions for automatic transfer to battery back-up in case of primary power failure, and batteries sized for 60 hours of operation.
- W. Wire Guards: Wire guards shall be made of 3/16" minimum steel wire with a corrosion resistant coating equipped with integral mounting rings. Provide wire guards for all devices located in gymnasium.
- X. All devices installed on the exterior shall be weatherproof.
- Y. All A/V devices in gymnasium at bleachers or any other facility with bleachers shall mount the fire alarm devices 80" above top of bleachers.
- Z. **Monitoring - Provide 2-years of monitoring for the fire alarm system in the base bid from the date of substantial completion.**

2.44. BELLS:

- A. Bells for the Bell System shall be 6" round with voltage to match the central bell controller and equal to Edwards Adaptable.
- B. Provide 120 volt bells and interposing relays where required by long distances from the central controller.

2.45. INTERCOM SYSTEM:

- A. General: Intercom system in new construction shall be added to the existing Dukane intercom system Master Control Console. Upgrade existing system as needed to add new speakers and horns.
- B. Loudspeakers: Soundolier #C10, recessed ceiling mounted with flush baffle, back box, and necessary mounting hardware.
- C. Speaker Horns: Provide wall mounted speaker horns with wire guards where shown with all mounting hardware.

2.46. CONCRETE:

- A. Concrete for electrical requirements shall be:
 - 1. Composed of fine aggregate (sand), coarse aggregate (graded from three-sixteenth (3/16) inch to one (1) inch), Portland cement, and water proportioned and mixed so as to produce a plastic, workable mixture.
 - 2. Aggregates shall be free from detrimental amounts of dirt, vegetable matter, soft fragments, or other foreign substances.
 - 3. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities.
 - 4. Concrete shall have a minimum 3000 psi ultimate twenty-eight day compressive strength and a maximum three (3) inch slump.

PART 3 - EXECUTION

3.01. GENERAL:

- A. This section includes the installation of the complete electrical system.

3.02. ELECTRICAL SYSTEM DEMOLITION:

- A. Before any new work begins the Contractor shall determine and document in writing to the satisfaction of the Engineer the condition of existing electrical work and auxiliary systems that are to remain in service. After the new work begins any existing electrical work or systems that are found to be inoperative or defective and not so documented shall be repaired or replaced by the Contractor at no additional cost to the Owner.
- B. Existing electrical equipment and materials to be reused shall be tested and repaired as required and installed for first class operation.
- C. General: The manner-in-which the remaining portions of the electrical system are terminated, supported and generally maintained for permanent use shall comply with all applicable regulations of the National Electrical Code, applicable NFPA codes and any local codes.
- D. Refer carefully to construction drawings prior to commencing with demolition to determine the intent of demolition. Contact the Engineer if there appears to be any conflict between the demolition and construction drawings.
- E. See "Renovation" Section regarding modification and relocation of circuits.
- F. Phasing: Phasing shall be as coordinated by the General Contractor.
- G. Work in Occupied Areas: Coordinate work carefully with General Contractor to provide minimum disruption to occupied portions of project. Provide minimum of 24 hours advance notice to Owner of demolition activities that will affect Owner's normal operation.
- H. Protections: Take necessary measures as required for protection of the Owner's personnel and the general-public, as well as Owner's property. Provide temporary barricades, partitions, bracing, and weather protection as needed. Remove all temporary protections at completion of work.
- I. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. Maintain portable fire suppression equipment during flame-cutting operations.
- J. System Protection: Protect and maintain all portions of existing system not indicated for demolition, including but not limited to light fixtures, panelboards and circuits.
- K. Fire Protection: Coordinate with general contractor to ensure that all penetrations of fire-rated decks and partitions are properly sealed.
- L. Removal of Circuits: All circuits indicated for removal shall be entirely removed, including raceway, back to take-off point or as far as possible without chasing (unless chasing is indicated). Where it is not possible to remove conduit, all conductors shall be removed and the conduit shall be permanently capped. Floor outlets indicated for removal shall be entirely removed, including outlet box, and capped below floor level (minimum 4" below floor level if in slab).

- M. Where floor slab is damaged in the course of demolition, it shall be permanently repaired as soon as practicable.
- N. Leave existing branch circuits and feeders which run through reworked areas and serve existing equipment to remain in service, continuous and uninterrupted.
- O. Where service interruptions are required, obtain approval for interruptions in writing from Architect 14 days prior to interruption. Submit schedule of work to be performed and the time required to accomplish work with request for interruption.
- P. Disposition of Material: Where electrical equipment is indicated for removal and not indicated for re-use, the owner shall have the option of taking possession of the equipment, the Contractor shall deliver any such material to a local site designated by the owner. The Contractor shall be responsible for disposing of all other materials in accordance with applicable codes and laws.

3.03. ELECTRICAL SYSTEM RENOVATION:

- A. General: Provide renovations as indicated on drawings and specified herein as required for a complete, operational system, even though every item is not indicated.
 - 1. This Section is intended to serve as a supplement to the applicable sections within this Division, and in no way relieves the contractor from the requirements of any other Section.
 - 2. All renovations shall comply with all applicable regulations of the National Electric Code, applicable NFPA codes and any local codes
- B. Materials and workmanship: Execute all work presenting a neat and workmanlike appearance when completed. Except where otherwise indicated, all materials shall be new, UL approved where a standard has been established. Where specific means and methods for affecting renovations are not covered in drawings and specifications, the contractor shall exercise prudent judgment in following accepted practices.
- C. Modifications: All major deviations from the drawings and specifications shall be approved in writing by the Engineer.
- D. Inspection:
 - 1. Inspect all existing electrical system components which are accessible, including fixtures, wiring devices, raceway and panelboards.
 - 2. Perform minor repairs to loose or damaged connections, damaged or missing supports, replacement of broken devices, replacement of missing plates and junction box covers and other visible damage or disrepair.
 - 3. Report major damage to Engineer.
- E. Renovation Services: In addition to the scope of work indicated on the drawings and specified herein, it shall be the responsibility of this Division to provide minor modification and repair services made necessary to electrical system components through the normal course of renovation. Such services shall include but not be limited to minor repair or relocation of branch circuits necessitated by the work of other trades, as coordinated by the General Contractor.
- F. Penetrations: Coordinate penetrations of existing walls, decks, and roofs required for electrical system with General Contractor. Do not cut structural members without the prior consent of Structural Engineer.
- G. Raceway.
 - a. Unless specifically indicated otherwise, existing raceway may not be used.
 - b. Where existing raceway is indicated for possible re-use, it shall be the responsibility of this Division to verify that the condition and configuration of the raceway is in compliance with the NEC.
- H. Panelboards: Where new circuits are run to an existing panelboard, thoroughly inspect the panelboard for any indications of arcing, overheating, or other damage. Report damage to the Engineer. Unless specifically allowed, tandem circuit breakers shall not be utilized.
- I. Clearing of Neutral Faults: Any and all neutral faults to ground on existing system shall be corrected.

- J. Service Ground: Visually inspect existing service ground electrode system for damage and code compliance. Check continuity from panel to each electrode with a meter. Make repairs as required.
- K. Lighting Fixtures: Where existing lighting fixtures are indicated for re-use, they shall be thoroughly cleaned and re-lamped, no exceptions. Where existing lighting fixtures are indicated for replacement, it shall be the responsibility of this Division to verify the compatibility of new fixtures with existing ceiling type, existing penetrations, available support, and other existing conditions prior to submittal of fixtures. Any variances or required modifications shall be clearly indicated on the fixture submittal.
- L. Backfilling, Grading, and Sodding:
 1. Restore surface features, including vegetation, at areas disturbed by Work of this Section.
 2. Reestablish original grades, unless otherwise indicated.
 3. If sod has been removed, replace it as soon as possible after backfilling is completed.
 4. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition.
 5. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces.
 6. Restore disturbed paving as indicated.

3.04. ELECTRICAL SERVICE:

- A. General: Arrange with local electric Utility Company for service to be brought to the building, and for installation of meter. Provide all material and labor not supplied by Utility Company so as to produce a complete installation meeting the Utility regulations.
- B. Service requirements: It is the responsibility of this Section, prior to bid, to reaffirm with the Utility Companies involved, that locations, arrangement, Power Company voltage, phase, metering required, and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, contract price shall include an additional cost necessary to meet those regulations without extra cost to Owner after bids are accepted.
- C. Notify Architect of any changes required before proceeding with work.
- D. Fees and deposits:
 1. The Electrical Contractor shall be responsible for verification and payment of all utility fees associated with installation of the electrical service.
 2. The Owner shall pay the cost of establishing an electrical service account and permanent meter deposit.
- E. Metering: Obtain metering equipment from Utility Company and install in compliance with the Utility Company's requirements. The Electrical Contractor shall provide and install all necessary metering raceways, fittings, supports, connectors and ground conductor necessary for a complete installation. Provide 100# pull wire in all metering conduits.
- F. Main Service Equipment: Provide UL approved service entrance components as indicated on drawings or specified herein.
- G. Provide a full-size copy of the AS-BUILT Power Riser Diagram framed behind plexiglass screwed to the wall near service entrance in main electrical room.
- H. Service lateral or feeder: Extend lateral or feeder of the size shown on drawings from service equipment to the point of service as indicated (verify exact location with Utility Company).
 1. For Overhead Service, provide and install service entrance fitting on conduit and leave sufficient slack conductor for connection to utility feeder 10' above finish grade, 12' above drive and 18' above street.
 2. For Underground Service, provide and install underground conduit to utility riser, as directed by Utility Company. Conduit shall be of size and quantity as indicated on drawings. Provide 480# polypropylene pull line in each empty conduit.
 3. For Underground Service, provide and install transformer pad, primary underground conduit to utility riser as directed by Utility Company, underground secondary conduit, and secondary conductors. Conduit shall be of size and quantity as indicated on drawings.

Provide spare 4" conduit in transformer pad extending 2' beyond edge of pad with PVC cap. Provide 480# polypropylene pull line in each empty conduit.

4. On service transformers with multiple taps, it shall be the responsibility of this section to coordinate tap selection with the electric utility to insure the proper nominal voltage.

3.05. GROUNDING:

- A. Bond the neutral conductor and various conductive materials in the building per NEC Article 250.
- B. Grounding Electrode System: A bare copper grounding conductor shall be bonded to grounding electrodes as specified below. This conductor shall serve as ground for system neutral and for building equipment bonding. Where conductor is #6, or smaller, or is subject to injury, it shall be run in conduit, Schedule 80 PVC or Rigid Galvanized to which the conductor shall be bonded at both ends.
 1. Grounding electrodes shall be as follows:
 - a. Cold water piping, if metal and in direct contact with the earth for 10 feet or more, at the point of entry into the building. Attach ground conductor to cold water piping with UL approved bronze clamp.
 - b. Building structural steel, if present and accessible.
 - c. Grounding electrode shall be attached with exothermic weld connection or irreversible crimp type connector similar to Burndy YGHR connectors. Crimps must be made with Burndy tool approved by the manufacturer for setting irreversible crimp connections.
 - d. Foundation reinforcing bar system. Coordinate with General Contractor to provide turned up re-bar (sleeved) near service point for attachment of grounding electrode above grade. Grounding electrode shall be attached with UL approved exothermic weld connector.
 - e. Driven ground rod(s).
 - 1) Three 3/4" x 10' copper weld rods shall be driven into the ground at the lowest point adjacent to the building, spaced a minimum of 10' apart.
 - 2) Ground rods shall be driven to 12" below grade.
 - f. Grounding electrode shall be attached with exothermic weld connection or irreversible crimp type connector similar to Burndy YGHR connectors. Crimps must be made with Burndy tool approved by the manufacturer for setting irreversible crimp connections.
 - g. Existing grounding electrode system. If an existing electrical service is in place, it must be bonded to the new grounding electrode system.
- C. Connections to grounding rods, building structure, counterpoise, and conductor junctions shall be made by exothermic weld unless specifically noted otherwise.
- D. Electric system (neutral) ground: The current carrying neutral leg of the wiring system shall be of insulated conductor and shall be connected to the grounding electrode conductor only via the neutral connection at the service equipment. Each branch circuit or multi-outlet branch circuit shall be provided with a dedicated neutral conductor.
- E. Equipment grounding conductors:
 1. An equipment grounding conductor (copper with green insulation except where bare copper is used) shall be provided in all wiring raceways.
 2. Sizes shall be in accordance with NEC 250.
 3. The equipment grounding conductor shall originate in the same panelboard, panelboard section, as the circuit conductors.
 4. The equipment grounding conductor bonding the sections of multi-section panelboards shall be sized per NEC 250.
 5. The equipment grounding conductor is not included in number of branch circuit conductors indicated on the drawings.
- F. Gas piping: Bond interior above grade gas piping to the grounding electrode.
- G. Isolated ground:
 1. Where isolated ground receptacles are indicated, a separate insulated isolated grounding conductor shall be run back to the point of origin in the service panel.

2. Where panelboards are fed from step down, dry type transformers, the isolated grounding conductors shall be terminated on a separate grounding buss in the panelboard. The isolated grounding conductors shall not pass through the panelboard.
 3. Isolated grounding conductors shall be color-coded green with yellow stripe (green and yellow tape on black conductors).
 4. A separate insulated ground bar may be installed in panels for connecting the isolated grounding system.
 5. The isolated grounding conductor between panels shall be the same size as the equipment grounding conductor.
 6. The isolated grounding conductors are not included in the number of branch circuit conductors indicated on drawings.
 7. Isolated ground outlets shall not share phase conductors or neutral conductors with any other circuits and shall not be circuited as multi-outlet branch circuits.
 8. An isolated ground branch circuit shall consist of the following:
 - a. One phase conductor
 - b. One neutral conductor
 - c. One isolated ground conductor
 - d. One equipment ground conductor
 9. These conductors may be installed in raceway with non-isolated ground circuits, but only both circuits may utilize the equipment grounding conductor. Isolated ground receptacles may be installed with an adjacent convenience receptacle in a two-gang box.
- H. Telephone service ground: provide a minimum #6 bare, solid copper grounding conductor from the electrical service grounding connection to the TBB. Leave six (6) feet minimum of free conductor. Install the conductor in PVC conduit where inside the building.
- I. Computer backboard ground: provide a minimum #6 bare, solid copper grounding conductor from the electrical service grounding connection to the CBB. Leave six (6) feet minimum of free conductor. Install the conductor in PVC conduit where inside the building.
- J. Grounding electrode resistance shall be less than 15 ohms. The resistance of the grounding electrode shall be tested by the Fall of Potential Method.
- K. Lighting Standards (Poles): Install 10' driven ground rod at each pole. On non-metallic poles, ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.
- L. Each grounding conductors at the service entrance ground bus bar shall be provided with a brass round identifying tag. Tag shall indicate where ground wire is terminated.

3.06. EXCAVATION, CUTTING AND BACKFILLING:

- A. Provide cutting and patching, under the supervision of the General Contractor, as required for the work in Section 16.
- B. Locate all existing below grade and/or below floor utilities prior to beginning any site excavation or cutting of existing floor slabs. The Contractor shall repair any damage to existing utilities or systems.
- C. Saw cut existing concrete slabs and asphalt paving.
- D. Trenching:
 1. Dig trenches true to line, with a flat, even bottom.
 2. Width of the trench shall provide not less than 3 inches clearance from the conduit to each side of the trench.
 3. Ensure that foundation walls and footings and adjacent load bearing soils are not disturbed in any way.
 4. Conduits shall be installed below footings where possible. Where a line passes under a footing, make crossing with the smallest possible trench to accommodate the conduits/sleeves.
 5. Where a line must pass adjacent to and below the bottom of a column footing, or the corner of a continuous footing, backfill the trench with concrete up to the level of the footing bottom, for a distance away from the footing equal to the depth of the fill.

6. Keep excavation free from water, by pumping if necessary.
 7. Where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level to proper elevation with sand or earth free from particles that would be retained on a ¼-inch sieve.
 8. Remove and relocate existing obstructions as directed.
 9. The Contractor shall be responsible for the repair and/or replacement of any damage to existing utilities, structure, or finishes.
 10. Coordinate work with other trades as work progresses so cutting and patching will be minimal.
 11. Refer to Section "Earthwork" for shoring, sub-soil assumptions and data, work around trees, surplus earth, etc.
- E. See Section 16100, "Conduit Installation, Below grade and below slab conduit installation", for installation of conduits in trenches.
- F. Backfilling:
1. Immediately after inspection, cover conduits with 3" of compacted sand or earth free from particles that would be retained on a 1/4inch sieve. Do not to disturb the alignment or joints of the conduits.
 2. Carefully backfill with 4" of earth free from clods, brick, etc., firmly puddling and tamping.
 3. Thereafter, puddle and tamp every vertical 4" for hand tamping or 8" for heavy duty mechanical tamping.
 4. Backfill shall meet the compaction requirements set forth in Division 2.
 5. Backfilling Beneath Slabs and Pavement: Trenches beneath future slabs or pavement, including but not limited to buildings, drives, parking areas, sidewalks, playground surfaces, and equipment pads, shall be backfilled, from 3" above top of conduits to final grade, with crushed aggregate, AHD 825, type B, compacted in 4" layers to 100% ASTM 698.
 6. Install marking tape above conduits at 12 inches below grade.

3.07. SLEEVES, INSERTS, AND SUPPORTS:

- A. Provide and install No. 16 gauge galvanized steel or iron sleeves in all walls, floors, ceilings, and partitions. Sleeves shall have no more than 1/2" clearance around pipes and insulation.
- B. The contractor shall furnish to other responsible trades all sleeves, inserts, anchors and other required items which are to be built in by other trades for securing of all hangers or other supports by the Contractor.
- C. The contractor shall assume all responsibility for the placing and sizing of all sleeves, inserts, etc., and shall either directly supervise or give explicit instructions to other trades for their installation.
- D. The contractor shall seal all conduits through floors, smoke partitions, and floor partitions, with a sealant approved for the application.
- E. All sleeves through sound barrier walls and partitions shall be sealed with mineral wool.
- F. Through the floor conduit penetrations shall be sealed watertight.
- G. Furnish and install steel angles and channels as required for mounting and bracing heavy equipment and conduits. Steel shall be securely bolted or welded to structure and equipment bolted to the steel framework. Obtain the approval of the Architect prior to welding.

3.08. BELOW GRADE THRU WALL WATER SEALS:

- A. Each conduit penetrating exterior, below grade, cast concrete walls shall have the annular space around the conduit sealed with an approved Thru Wall Water Seal System.
- B. Where the system includes water seal thru wall sleeves, the Electrical shall provide properly sized sleeves to the contractor responsible for constructing the walls and shall be responsible for the proper location of each sleeve.
- C. Where openings are to be core drilled, the Electrical Contractor shall be responsible for the core drilling and for coordinating proper sizing and location of each opening.

3.09. FIRE STOPPING:

- A. The Electrical Contractor shall be responsible for firestopping of all penetrations of fire rated partitions made by any and all lighting, power, and auxiliary circuiting, sleeves and/or equipment.
- B. The Electrical Contractor shall submit manufacturers' UL System drawings for the systems to be utilized. The systems shall be compatible with the partition ratings as indicated on the Architectural drawings and in accordance with details on the Electrical drawings.
- C. Penetrations of fire rated partitions shall be sealed with an approved fire sealant resulting in the completed penetration having the same fire rating as the partition.
- D. The installation shall be in accordance with the manufacturer's UL system detail and installation instructions to attain the required fire partition rating.
- E. Empty sleeves through 1 and 2 hour rated partitions shall be plugged with mineral wool.
- F. Sleeves through 4 hour rated partitions shall be plugged with mineral wool and fire stopping material.

3.10. ROOF PENETRATIONS:

- A. Furnish roof flashing for all equipment, installed under Section 16, which penetrates through the roof. Flashing shall be approved by the Architect prior to installation.

3.11. CONDUIT INSTALLATION:

- A. Conduits shall be as follows:
 - 1. Overhead Service Entrance - Rigid Galvanized Steel (RGS) Conduit or IMC.
 - 2. Underground Service Laterals: Schedule 40 rigid PVC in horizontal runs with rigid galvanized steel elbows turning up to vertical RGS.
 - 3. Where subject to moisture or mechanical injury - RGS conduit.
 - 4. ALL conduits exposed to moisture or subject to mechanical damage shall be RGS. Where conduit exits building, the changeover from EMT to rigid shall be inside exterior wall.
 - 5. In open shop and industrial installations RGS shall be run to 10' A.F.F.
 - 6. All conduit exposed on the outside of the building envelope shall be Rigid Galvanized Steel (RGS) conduit. This includes all conduits on and/or under canopies or awnings.
 - 7. In concrete or solid masonry – RGS conduit
 - 8. Above furred spaces or in cells of hollow masonry - EMT
 - 9. Concealed inside drywall construction walls and above lay-in ceilings – EMT.
 - 10. Exposed conduits:
 - a. Conduits installed exposed in shop, warehouse, and manufacturing areas shall be RGS up to 12' A.F.F. Conduits in such spaces above 12' A.F.F. may be EMT unless indicated otherwise on the drawings.
 - b. Exposed indoors in non-hazardous unfinished areas not subject to physical damage - EMT
 - c. Exposed in kitchen and dishwashing areas: Rigid aluminum.
 - 11. Branch circuits in slab (3/4" and larger) - PVC. Turn up through slab with RGS ells - no exceptions. Extend rigid turn-ups 2" minimum above finish floor level.
 - 12. Circuits beneath building vapor barrier - PVC. Turn up through slab with RGS ells - no exceptions. All elbows 45° and greater shall be RGS. Extend RGS turn-ups 2" minimum above finish floor level.
 - 13. Below Grade – PVC with RGS, or rigid aluminum where applicable, elbows turning up to vertical. All below grade elbows 45° and greater shall be RGS.
 - 14. Motor, HVAC equipment, and vibrating equipment connections - flexible metal conduit, liquid tight flexible metal conduit outdoors, in kitchen and dishwashing area, or in other wet areas. Liquidtight flexible nonmetallic conduit shall be used only where specifically indicated.
 - 15. IMC may be used where RGS is indicated.
- B. Conduit sizes:

1. Unless specifically indicated otherwise herein or on the drawings, the minimum conduit size shall be 3/4".
 - a. All conduits installed below grade or below slab shall be 3/4" minimum.
 - b. The minimum size for flexible lighting fixture "whips" shall be 3/8" and the maximum length shall be 6 feet. Lighting fixture "whips" shall be defined as flexible conduits with conductors feeding one or more recessed lighting fixtures installed in suspended, lay-in, acoustical ceiling systems from a single junction box.
 - c. 1/2" conduit may be for final connections to equipment or fixtures where conduit is less than three (3) feet in length and is extended from a junction box or from a 3/4" conduit stub up.
 2. Conduits shall be sized in accordance with the National Electrical Code as adopted by the local authority having jurisdiction or as amended to date, except where a larger size is indicated on the drawings or specified herein.
- C. Layout:
1. Generally, follow the conduit layout shown on the drawings. However, the layout is diagrammatic only and must be adjusted for structural conditions, built-in equipment and other factors. Offsets are not indicated and must be furnished as required.
 2. Install all conduits concealed except in equipment rooms and where exposed runs are specifically indicated.
 3. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossings are unavoidable, then conduit shall be kept at least 1" from the covering of the pipe crossed.
 4. Eliminate trapped runs insofar as possible.
 5. Do not chase new work, but instead build in conduit as work progresses.
 6. Do not run conduit in cavity of exterior walls.
 7. Run concealed conduits in direct line with long sweep bends and offsets where practicable.
 8. Install exposed conduit with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical bends.
 9. Where conduits are indicated exposed overhead, runs down to wall outlets shall be concealed in wall.
- D. Conduit Installation:
1. Securely fasten conduits to all sheet metal outlets, cabinets, junction and pull boxes with locknuts and bushings, taking care to see that stout mechanical and solid electrical connections are obtained.
 2. All conduits shall have bushings with smooth beveled throats installed at both ends prior to installing conductors. Split bushings around conductors shall be taken to indicate that the conductors were pulled into conduit without the proper bushings installed and a basis for requiring the replacing of the conductors.
 3. Conduits entering service enclosures (panelboards, disconnect switches, switchboards, motor control centers, etc. used as service entrance equipment) shall be provided with specification grade, insulating, grounding type bushings. Grounding bushing shall be bonded together and bonded to the service grounding buss.
 4. Support:
 - a. Raceways shall be securely and rigidly supported to the building structure in a neat and workmanlike manner, and wherever possible, parallel runs or horizontal conduit shall be grouped together on adjustable trapeze hangers.
 - b. Support shall be provided at appropriate intervals not exceeding eight (8) feet with straps, hangers, and brackets specifically designed for the application.
 - c. Channels shall be 1 inch for 18-inch wide trapeze, 1-3/8 inch for 24 to 30 inch, and 1-5/8 inch for over 30-inch wide trapeze.
 - d. Perforated steel straphangers, "butterfly clips", or tie-wire supports are not acceptable.
 - e. Conduits shall not be supported from ceiling support wires.
 - f. Conduit shall not be supported from mechanical system ducts or piping.

- g. Conduits installed along wall surfaces shall be supported with galvanized steel brackets specifically designed for conduits and sized for the conduit used.
 - h. PVC conduits shall be supported per the NEC with PVC or stainless clamps and stainless-steel hardware.
 - h. Attach to supporting devices with screws, bolts, expansion sleeves or other workmanlike means appropriate to the surface.
 - i. In stud walls, anchors shall be completely rattle proof.
 - j. For conduits in damp and wet locations, use stainless steel clamps and stand-offs, or galvanized malleable or cast-iron clamps and spacers.
 - k. All mounting hardware for aluminum conduit shall be stainless steel.
 - l. Surface mounted conduits installed in kitchen and dishwashing areas shall be supported off walls approximately 3/16".
5. Thread rigid conduits so that the ends meet in couplings; cut ends square, ream smooth and draw up tight.
 6. All field cut threads shall be cleaned with a solvent such as mineral spirits and painted with two coats of galvanize primer.
 7. Cap conduit ends to keep out water and trash during construction.
 8. Field made bends:
 - a. Avoid field-made bends where possible, but where necessary, use a proper hickey or conduit-bending machine.
 - b. Field made bends in PVC conduit shall be made with a heated PVC conduit bender.
 - c. Make no bends with radius less than six times the conduit diameter, nor more than 90 degrees.
 9. Make changes in direction with pull boxes, symmetrical bends and/or cast-metal fittings.
 10. Total bends in any conduit run shall not exceed the equivalent of four, quarter (90°) bends for a total of 360°, per NEC, between pull boxes.
 11. Replace any crushed or deformed conduits.
 12. Conduits passing through roofs shall be in place before roof is installed.
 13. Conduits installed in concrete/grout filled CMU walls shall be Rigid steel or IMC conduits installed field wrapped with 0.010 inch-thick pipe-wrapping plastic tape applied with a 50 percent overlay. Painted on coating shall not be acceptable.
 14. Where conduits pass through or across building expansion joints, provide hot-dipped galvanized expansion fittings with bonding jumpers.
 15. Ensure that all penetrations of firewalls are sealed per NEC and IBCC.
 16. Right and left couplings shall not be used; conduit couplings of the Erikson type shall be used at location requiring such joints.
 17. Paint all conduits exposed in finished spaces. Paint shall consist of one coat of zinc rich primer plus two top-coats of water-based latex paint, color to match adjacent finishes. Verify colors and paint system with Architect.
 18. All conduit runs entering the building from outdoors shall be sealed against moisture migration and condensation by filling with insulating type foam.
 19. All conduits passing through walls of coolers or freezers shall have seal fitting installed on the outside of the cooler/freezer wall and within 3" of the wall. Fitting shall be sealed per manufacturer's recommendations.
 20. Install telephone, data, intercom, and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
- E. Below grade and below slab conduit installation:
1. See Section 16100, "Excavation, Cutting, and Backfilling" for trenching and backfilling requirements.
 2. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system. Painted on coatings shall not be acceptable. Wrap shall extend a minimum of 1"

- above slabs or 3" above finished grade where there is no slab. Alternate methods must be approved by Engineer prior to bids.
3. Top of the conduit shall be not less than 30 inches below grade.
 4. Run conduit in straight lines except where a change of direction is necessary.
 5. Conduits stubbed up from below grade or slab into exterior walls shall be turned toward the interior of the building below slab fill perpendicular to the wall. Conduits shall not be turned out toward the exterior unless specifically indicated to do so.
 6. Placing of conduits below slab on grade:
 - a. Conduits 1-1/4" and larger shall be installed a minimum of 12" below the bottom of slab in the clay/sand fill below any gravel fill material.
 - b. Conduits 1" and smaller may be installed in the porous/gravel fill below the vapor barrier.
 7. Multiple Conduits:
 - a. Separate multiple conduits by a minimum distance of 2-1/2 inches horizontally and 3 inches vertically, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of 3 inches horizontally and vertically.
 - b. Where multiple layers of conduits are to be placed in a trench, each layer shall be placed in the trench, straight and parallel, clear fill material (see Excavation, Cutting, and Backfilling) placed and tamped in place to provide the specified spacing, and each subsequent layer placed in the same manner.
 - c. Stagger the joints of the conduits by rows and layers to strengthen the conduit assembly.
 - d. Conduits shall not be placed haphazardly in the trench.
 8. Where conduits pass through footings or foundation walls:
 - a. Conduits roughed in beneath slab shall exit the foundation perpendicular to the building spaced approximately 3" apart. Conduits shall be arranged in a single horizontal row where practical.
 - b. Secure approval from the Architect and Structural Engineer prior to penetrating any footing or foundation wall.
 - c. Schedule 40 PVC sleeves shall be cast in the footings or foundation wall for the conduits to pass through.
 - d. Multiple sleeves shall have 3" clearance, vertically and horizontally, between the sleeves unless directed otherwise by the Architect and/or Structural Engineer.
 9. Where PVC conduit is installed below grade a PVC to rigid metallic conduit coupling shall be installed in the horizontal run and a rigid galvanized steel conduit elbow installed to turn up to above grade. Where above grade conduits are indicated to be rigid aluminum the elbow turning up to vertical shall be rigid aluminum.
 10. Rigid aluminum conduit shall be wrapped same as RGS through concrete from 2" each side of the concrete.
 11. Rigid galvanized conduit shall extend a minimum of 6" above the finished floor level.
 12. In hazardous areas the coupling shall be below grade and a single section of conduit installed up to 18" A.F.F. to accept the required seal fitting.
 13. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used from 6 inches above the floor to the served equipment.
 14. Conduits shall exit concrete slabs vertically.
 - a. Where adequate support cannot be obtained by wiring to reinforcing steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring.
 - b. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.
 15. Empty or spare conduit stub-ups shall be capped with a threaded cap.
 16. Encasement Under Roads, Structures, and at other locations indicated on the drawings:

- a. Under roads, paved areas, railroad tracks, and other locations indicated on the plans install conduits in concrete encasement of rectangular cross-section providing a minimum of 3-inch concrete cover around ducts.
 - c. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assemblies shall consist of base spacers, intermediate spacers, and top spacers to provide a completely enclosed and locked-in conduit assembly.
 - d. Install #4 rebar at each corner of the encasement and at not more than 18" on center vertically and horizontally on the sides of the encasement. #4 rebar hoops shall be installed at not more than 18" on center along the length of the encasement.
 - e. Concrete encasement shall extend at least 5 feet beyond the edges of paved areas and roads, and 12 feet beyond the rails on each side of railroad tracks.
17. Conduits to be installed under existing paved areas, which are not to be disturbed, and under roads and railroad tracks, shall be installed through a zinc coated, rigid steel, sleeve, jacked into place.
 18. Conduits installed between handholes, manholes or other accessible areas shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward manholes and other necessary drainage points.
 19. The contractor shall provide properly rated and sized junction and pull boxes as required on all underground conduit runs 150 feet and greater so as to minimize pulling tensions on cables to be installed in conduits. In no case shall pull or junction boxes be further than 300 feet apart. Provide pulling tension calculations on all underground runs over 200 feet as required in Paragraph 1.09 Submittals.
- F. Conduit Installation in concrete slabs:
1. Conduit installed in concrete slabs shall be rigid steel or IMC. Rigid steel or IMC conduits installed in slabs-on-grade shall be field wrapped with 0.010 inch-thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system. Painted on coatings shall not be acceptable.
 2. At slabs on grade, conduit, 3/4" maximum, may be run in the slab; larger conduit shall be run below slab.
 3. Where adequate support cannot be obtained by wiring to reinforcing steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring.
 4. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.
- G. Flexible conduit:
1. At motor or equipment connections:
 - a. The maximum length allowable for flexible conduit shall be 36 inches except at lighting fixtures.
 - b. Flexible conduit installed outdoors shall be installed so as to provide an 8 inch minimum drip loop as measured from the lowest end of the conduit.
 2. At lighting fixture connections provide flexible steel conduit by one of the manufacturers named for rigid.
 - a. Maximum length allowable shall be 72 inches.
 - b. Support flexible conduit such that it does not contact the ceiling system, ductwork, or other equipment above the ceiling. The conduit shall not be attached to a ceiling or ceiling support system.
 - c. All fixture whips shall be supported within 12" of outlet/junction boxes with single hole clamps.
- H. Empty conduit:
1. Install a #14 galvanized fish wire or polypropylene pull cord with 14-inch free ends in all empty power and/or auxiliary conduits.
 2. All conduits indicated to be terminated above the ceiling shall have an elbow turned out above the ceiling and shall be terminated with an insulating bushing.
 3. Empty conduits stubbed out of buildings below grade:

- a. Empty conduits stubbed out of buildings below grade shall extend 5 feet outside of the building foundation.
- b. Install a 12"x 12"x 6" concrete marker at grade, above the end of the conduits, with "ELEC" inscribed on top.
- f. Note on as-built drawings the exact location where empty conduit(s) are stubbed out below grade to the building exterior. Indicate conduit sizes and number of each size.
- g. The contractor shall provide properly rated and sized junction and pull boxes as required on all underground conduit runs 150 feet and greater. In no case shall pull or junction boxes be further than 200 feet apart.
- I. Conduit entries into enclosures, panelboards, and wiring troughs:
 - 1. Layout conduit entries carefully to allow clearances for the number and sizes of conduits, electrical equipment, and future expansion.
 - 2. In sheet metal equipment use Greenlee Knock-Out punch, or equal, to cut holes for conduit installation. Do not drill holes or cut holes out with snips or torch.
 - 3. In cast enclosures and boxes drill conduit openings with correct size drill for tight fit.
- J. **All junction box covers above the ceiling shall be labeled to which circuits or systems they contain.**

3.12. CONDUIT BODIES:

- A. Conduit bodies shall be sized in accordance with NEC 370, and 373.
 - 1. Conduit bodies for conductor sizes AWG #4 and larger shall be mogul type bodies sized in accordance with NEC 370-28.
 - 2. Conduit bodies for conductor sizes AWG #6 and smaller shall be sized in accordance with NEC 370-16(c).

3.13. JUNCTION AND PULL BOXES:

- A. Junction and pull boxes shall be sized per NEC to accommodate the installed number and size of conductors and conduits.
- B. Boxes shall be securely fastened in place.
- C. Boxes serving lighting fixtures installed in accessible, suspended ceilings:
 - 1. Provide number of boxes as required to maintain fixture whips within the 6' maximum length.
 - 2. Generally, attach to underside of structure above, in accessible location, to accommodate a maximum 6' flexible conduit connection to each fixture or fixture run.
 - 3. Where the structure above is more than 18" above the ceiling the boxes shall be supported within 18 inches of the ceiling with all thread rod and/or strut.
- D. Install galvanized steel utility box plates, by box manufacturer, at exposed conduit fittings or boxes.
- E. **All junction box covers above the ceiling shall be labeled to which circuits or systems they contain.**

3.14. WIRE AND CABLE INSTALLATION:

- A. No conductor shall be smaller than #12 except where so designated on the drawings or specified elsewhere.
- B. Multiwire lighting branch circuits shall be used where indicated.
- C. Wiring devices shall be connected such that each device can be removed without interrupting the neutral or equipment grounding conductors serving other outlets on the same circuit(s).
- D. Joints and splices in wire shall be made with solderless connectors and covered so that insulation is equal to conductor insulation. Wire nuts shall not be used for conductor #8 and larger.
- E. No splices shall be pulled into conduit.
- F. Both conductors and conduit shall be continuous from outlet to outlet.
- G. No conductor shall be pulled into the conduit until the conduit is cleaned of all foreign matter.

- H. When installing parallel conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, and type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded together at both ends in an approved manner.
- I. MC cable or Romex cable will not be accepted unless specifically called for on drawings.
- J. Wiring thru light fixtures and receptacles will not be accepted.

3.15. AUXILIARY GUTTERS (WIRING TROUGHS):

- A. Auxiliary Gutters shall be sized per NEC to accommodate the installed number, size, and orientation of conductors and conduits.
- B. Conductors serving a gutter shall be extended without reduction in size, for the entire length of the gutter.
- C. All taps and splices shall be made with insulated multi-tap connectors.

3.16. CIRCUITS AND BRANCH CIRCUITS:

- A. Outlets shall be connected to branch circuits as indicated on the drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.17. WIRE JOINTS:

- A. Except for motor circuits, wire joints for #8 and smaller wire shall be made with twist on connectors.
- B. Wire joints and splices for motor circuits, for conductors #6 and larger, and for smaller conductors where other connectors are not rated for the number of conductors involved shall be made with split bolt connectors rated for the applicable conductor size, number of conductors, and conductor material.
 - 1. Properly tape and insulate all joints to attain the same insulation rating as the cable insulation.
 - 2. Splices for #6 through #1 shall have a minimum of two (2) layers of rubber tape covered by a minimum of three (3) layers of electrical tape.
 - 3. Splices for #1/0 and larger conductors shall have a minimum of two (2) layers of electrical filler tape covered by a minimum of three (3) layers of electrical tape.
- C. Splices in control conductors shall be avoided as much as possible. Stranded control conductor up to #12 may be connected or spliced with hand crimped type compression connectors. The connectors shall be of the proper size for the conductors being connected.
- D. Splices and joints made with mechanical/hydraulic type compression connectors:
 - 1. Connections and splices shall be made with connectors rated for the applicable conductor size and conductor material.
 - 2. Dies used shall leave the die number embossed in the connector. The Contractor shall provide the Engineer with the Manufacturer's connector and die chart prior to final inspection.
- E. Taps and splices in auxiliary gutters/troughs shall be made with insulated multi-tap connectors.
- F. Wire joints and splices made below grade shall be made with UL listed waterproof connectors, wire nuts, or splice kits.
- G. All joints and splices shall be made in junction boxes, wiring troughs, or conduit bodies sized per NEC.
- H. All connections to switchboards, panelboards, transformers, generators, ATS, or any other type electrical distribution type equipment shall be compression type fittings. Mechanical fittings will not be accepted in these applications.

3.18. STRUT SYSTEM FOR SUPPORT OF ELECTRICAL EQUIPMENT:

- A. Strut Systems: Strut shall be utilized to rack exposed piping vertically or horizontally on walls and across slabs (where applicable). Strut may be utilized to support piping above ceilings, for support of equipment, and elsewhere as deemed appropriate.

1. Strut in conditioned spaces and above accessible ceilings shall be electro-galvanized.
2. Strut installed outdoors, in mechanical rooms, and in other unconditioned spaces shall be hot-dipped galvanized.
3. Strut installed in waste-water treatment facilities, kitchens, dishwashing spaces, and labs shall be stainless steel.
4. Strut fittings and hardware, including anchors, shall be same material as strut.
5. Saw cut strut square, 6" minimum lengths. Strut on continuous runs of pipe shall be same length. File or grind burrs from saw cuts.
6. After installation, electro-galvanized and hot-dipped galvanized strut shall be painted with two coats of zinc primer.

3.19. OUTLET BOX INSTALLATION:

- A. General: The drawings indicate approximate locations only; determine the exact location at the building in view of all structural and architectural conditions. Obtain Architect's verification of final locations.
- B. Outlet boxes shall be sized per NEC to accommodate the installed number and size of conductors, wiring devices, and conduits.
- C. Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.
- D. Typical boxes (for switches, receptacles and auxiliary systems): 4" square boxes ganged as required. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and otherwise appropriate for surface and construction.
- E. Boxes in Exposed (or Thin-Coat Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square-cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square-cut tile cover. .
- F. Boxes used with Exposed Conduit: 4" square utility boxes.
- G. Exterior Boxes: Cast-metal boxes, Crouse-Hinds Type FS or FD as appropriate. Make weatherproof with gasketed covers. Equal products by Appleton, Killark, O-Z/Gedney, or approved equal will be accepted.
- H. Boxes used with Recessed Lighting Fixtures in suspended acoustical tile ceilings:
 1. Provide a 4" square box with blank cover adjacent to each fixture or fixture group.
 2. Install a flexible metal conduit fixture-"whip" from the box to the fixtures. The "whip" shall not be longer than 72".
 3. Attach the box to the underside of the structure above, in an accessible location, not more than 18" above the lay-in ceiling.
 4. Where structure is more than 18" above the ceiling, the boxes shall be supported from all-thread rods, strut, or a combination of rod and strut.
- I. Boxes in Dry Wall Construction:
 1. Outlet boxes shall be securely fastened in place.
 2. Outlet boxes installed in metal stud construction shall be supported by brackets screwed to studs. Clip on brackets shall not be accepted.
 - a. Where a single outlet box is installed adjacent to a stud, brackets may attach to a single stud with a brace against the back of the opposite wall. Use a bracket equal to Caddy Fasteners "H" Series.
 - b. Where outlets do not fall next to a stud or where more than one outlet is installed between studs use a metal bracket attached to both studs. Brackets shall be equal to Caddy Fasteners "SGB", "TSGB", or "RBS" series brackets.
 - c. Outlet boxes three gangs and wider shall be supported with support member screwed to the two adjacent studs. Brackets equal to Caddy Fasteners SGB or TSGB brackets may be used.
- J. Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi- gang devices occur).

- K. Outlets in unfinished masonry walls may be slightly adjusted upward or downward to suit masonry courses, provided outlets are mounted at uniform heights throughout the installation.
- L. Coordinate installation of outlet boxes in masonry walls with the masonry contractor to insure that boxes are flush with face of wall and grouted smooth around boxes such that covers, fixtures or devices install flush on face of wall.
- M. Where outlets at different levels are shown adjacent, install in one vertical line where possible. Avoid conflict with wainscot caps, splash backs and upper cabinets by adjusting height slightly up or down as directed.
- N. Back to back boxes shall be staggered with at least 3 inches between boxes.
- O. Back to back boxes in fire rated partitions shall have a minimum of 24" horizontal and/or vertical separation between them.
- P. Backs of boxes three gang and larger installed in fire rated partitions shall be wrapped with self adhesive fire stopping tape.
- Q. Locate switch outlets on the lock side of doors and so that the first switch in a single or gang installation is approximately 6" to 10" from the doorjamb. Verify door swings on Architectural Drawings.
- R. Dimmers shall be ganged together in accordance with the manufacturer's instructions where appropriate but shall not be ganged with toggle switches.
- S. Coordinate carefully with appropriate trades the size and orientation (vertical, horizontal) of outlet boxes for thermostats, data outlets, fire alarm equipment, security equipment, and other control and communications outlets.
- T. Mounting Heights:
 Confirm all mounting height with local codes and authorities prior to bid and adjust as required:

Switches, generally	48" A.F.F. to top of outlet
Safety switches	Center of Switch 48" A.F.F. or as required.
Receptacles, generally	16" A.F.F. to bottom of outlet
Receptacles over counters	Bottom of outlet 6" above countertops or 2" above backsplashes
Computer Outlets	16" A.F.F. to bottom of outlet
Wall mounted exit and emergency lights	Bottom of fixture 7'- 6" A.F.F. or 12" below Ceiling whichever is lower
Thermostat	Top of outlet 48" A.F.F. or as noted by mechanical drawings.
Brass bell	Top of outlet 12" below ceiling, 8' maximum.
Electric Water Coolers	Coordinate location with plumbing contractor to locate the receptacle(s) concealed within the EWC enclosure per manufacturer's installation instructions.
- U. Install blank coverplates on all unused power and auxiliary outlet boxes. Blank coverplates shall match other cover plates installed in the facility.
- V. Furnish blank plates, matching those on the other outlets in the same area, on TV outlets and other outlets installed for future use.

3.20. WIRING DEVICES:

- A. Install wall devices vertically' unless otherwise noted, so that all devices of any given height will align exactly.
- B. Where boxes are not flush or square with the finished wall surface install wiring devices utilizing a leveler and retainer equal to Caddy #RLC or Steel City #SSF-SR.
- C. Plates shall be plumb and true with all four edges contacting wall surface.
- D. Mount receptacles with grounding terminals down.
- E. Do not install devices until plastering or other type wall covering has been completed; install ahead of painting work but protect from paint spatter.

- F. Use screw terminal connections only.
- G. Do not gang dimmer switches with toggle switches.
- H. Each single or multi outlet receptacle, other than straight blade, 15 or 20 amp, 120 volts, NEMA 5-15R or NEMA 5-20R, shall be provided with matching cord plugs and a minimum of 8 feet of Type SOW cable matching the receptacle size and configuration.
- I. Pin and sleeve plugs for food service equipment shall be provided with a Type SOW cable connected to the equipment and plug of sufficient length to reach from the equipment to the plug with a minimum of 18" slack cord. Minimum length shall be 6 feet from equipment to plug.
- J. Provide "Kellums" type grips at the plug, cord connector, and for overhead support on all overhead cord connector drops.

3.21. OCCUPANCY SENSORS AND ASSOCIATED DEVICES FOR LIGHTING CONTROL:

- A. Occupancy sensors and associated devices and circuiting shall be installed in strict accordance with the manufacturer's instructions.
- B. Wall, corner mounted sensors shall be mounted as close to the ceiling as possible on the manufacturer's corner mounting bracket.
- C. Power packs shall be mounted above the ceiling. Power packs shall be installed utilizing two(2) 4" x 4" x 2-1/8" deep boxes joined together using the nipple on the powerpack in accordance with the manufacturer's instructions. One of the boxes shall contain the power pack and control wiring and the other shall contain the power wiring.
- D. All control and power circuiting shall be in EMT conduit. Where the devices are not equipped with conduit connections the conduit shall be brought up as close as possible to the device and terminated with insulating bushings.

3.22. ELECTRICALLY POWERED EQUIPMENT AND CONTROLS:

- A. Provide and install power circuits for all electrically powered equipment and controls.
- B. Heating, Ventilating, and Air Conditioning Control Wiring and Conduit:
 - 1. The electrical contractor shall be responsible for installing outlet boxes for flush mounted HVAC system thermostats in dry wall or masonry wall construction and, where called for on the plans, for surface mounted metallic raceway in finished areas. Extend 3/4" conduit from the outlet to above nearest accessible ceiling and terminate horizontally. Refer to the Mechanical/HVAC plans for thermostat locations and coordinate exact type outlet required and orientation with the Mechanical/HVAC contractor.
 - 2. The Mechanical Contractor shall be responsible for the installation of all outlets and conduit for surface mounted devices in unfinished areas such as shops, warehouses, industrial facilities, etc.
 - 3. The mechanical contractor shall furnish and install all low and line voltage control wiring required for the temperature control and/or ventilation systems.
- C. Where Fire Alarm system duct mounted smoke detectors and HVAC shut down interface relays are provided, the Electrical contractor shall provide wiring from the smoke detectors to the HVAC shut down interface relay. All circuiting from the shut down relay to the HVAC controls and/or starters shall be provided and installed by the Mechanical/Controls contractor.
- D. The mechanical contractor shall furnish all motor starters for the temperature control and/or ventilation equipment unless otherwise indicated on the electrical plans or elsewhere in these electrical specifications. The electrical contractor shall install all motor starters, except for equipment with factory installed starters, for the temperature control and/or ventilation equipment.
- E. Where exhaust fans are supplied with field installed speed controllers, the Electrical Contractor shall provide all necessary circuiting to the fan/speed controller and between the fan and the speed controller.

3.23. DISCONNECTING MEANS:

- A. Where required by the National Electrical Code and/or other applicable codes or authorities, or where indicated on the electrical plans, the electrical contractor shall furnish and install an

approved disconnecting means for all electrically powered equipment and/or controllers for such equipment whether the disconnecting means is or is not shown on the electrical plans.

1. The location, rating, and enclosure for the disconnecting means shall be as required by the National Electrical Code and/or other applicable codes or authorities.
 2. Manual motor starters with thermal overload protection may be used in lieu of safety switches for individual motors under 1 horsepower.
 3. Motor rated switches may be used for the disconnecting means when supplied of correct voltage, phase, amperage rating, and enclosure type.
 4. The disconnecting means shall be as manufactured by General Electric, Cutler Hammer, or Siemens. Square D will not be accepted.
- B. Where the disconnecting means shown on the electrical plans has a rating greater than the required code rating, the greater rating device shall be installed.
- C. An approved horsepower rated fusible safety switch shall be installed where the circuit overcurrent protection does not provide overload protection for the equipment served and where required to meet the equipment's listing requirements.
- D. Motor rated switches may be used as service disconnect switches when supplied with a pad-lockable, handle locking guard.
- E. Install an engraved phenolic nameplate on the front of each switch enclosure identifying the equipment served by the safety switch and source of power (i.e., panel name and circuit number). Plates shall be white with black lettering. The plates shall be permanently installed with stainless steel screws or stainless-steel rivets.
- F. All disconnects installed in public areas or in areas readily accessible to the public shall be lockable and shall be furnished with a brass lock. Provide 10 keys for each lock. All disconnect locks furnished on the project shall be keyed alike.

3.24. LIGHTING FIXTURES:

- A. The installation and support of all lighting fixtures shall be the responsibility of the Electrical Contractor.
- B. Lay out work as shown, and to provide attractive and efficient arrangement.
- C. Install fixtures level, plumb, and true with ceiling and walls, and in alignment with adjacent lighting fixtures.
- D. Provide adequate and substantial supports for fixtures in accordance with manufacturers' directions and as specified herein.
- E. A Re-lock system will not be accepted for installing lights.
- F. Wire grid mounted luminaries individually to junction boxes with flexible conduit not more than 6 feet in length. Individual flexible connections shall be 2 #14 and 1 #14 ground THHN in 3/8" flexible conduit. Ground wire shall be bonded at each end.
- G. Light fixtures with center baskets shall have all fixtures in a room installed with the center baskets oriented in the same direction.
- H. Fixtures mounted in inverted "T" grids:
 1. For round fixtures or fixtures smaller in size than the ceiling grid, provide a minimum of two wires per fixture located within 4 inches of each corner of the ceiling grid in which the fixture is located. Do not support fixtures by ceiling acoustical panels. Fixtures shall be supported independent of the ceiling system or shall be supported by at least two metal channels spanning the grid system, and secured to, the ceiling tees. One support wire shall be attached to the center of the fixture or to each of the metal channels.
 2. Surface mounted fixtures:
 - a. Surface mounted fixtures installed on lay-in ceiling systems shall be supported independent of the ceiling system from the building structure with a minimum of two (2) 3/8", minimum, all-thread rods.
 - b. Install nuts and washers on inside and outside of the fixture housing to provide a rigid installation.
 - c. Provide cross bracing as required such that fixtures have no lateral movement.

- I. All stems on lighting fixtures shall be installed as follows: (except fixtures with slide grip hangers) first and last stem in row in first knockout from end of fixture. One stem shall be installed between each two fixtures, stem shall center joint, where fixtures join, and attach by use of "jointing plates". Nipples with lock nuts and bushings shall connect all fixtures in continuous rows other than recessed grid type.
- J. All suspended lighting fixtures shall be provided with chain or cable sway bracing to keep fixtures from swinging.
- K. Fixtures installed in fire rated assemblies shall be tented in accordance with the specified assembly.
- L. Means shall be provided to keep insulation 4" minimum away from fixtures not rated for direct contact with insulation.
- M. Prior to final inspection clean fixtures and lamps with a soft cloth or sponge and detergent (not soap) solution.
- N. All lighting fixtures installed in gymnasiums, hangars, high bay or similar use areas shall be equipped with wire guards.
- O. All emergency and exit lights designated on drawings shall be provided with an 1100-lumen battery ballast.
- P. All light fixtures shall be supported to the structure independent of the ceiling system on two opposite sides. Support wires shall be different color from ceiling support wires. Engage all ceiling mounting clips. If light fixture is not provided with grid support clips, then the contractor will be responsible to support the fixture on all four sides with support wires. See "Typical Lay-In Luminaire Detail" on drawings for further requirements.

3.25. PANELBOARDS:

- A. Panelboards shall be installed where shown on the drawings.
- B. Ratings and configurations shall be as scheduled and/or indicated on the drawings.
- C. The Electrical Contractor shall coordinate installation of equipment in Electrical and Electrical/Mechanical spaces with other trades such that Code required clearances and working space around the electrical equipment is maintained.
- D. Conduit termination:
 - 1. In general use panelboards with blank ends, without knockouts.
 - 2. Layout conduit entries carefully to allow clearances for drywall or CMU wall thickness, and to accommodate the number and sizes of home run conduits and specified spare conduits.
 - 3. Use Greenlee Knock-Out punch, or equal, to cut holes in panelboard ends and/or sides for conduit installation. Do not drill holes or cut holes out with snips or torch.
- E. Phase arrangement in panelboards shall be per the NEC, phase A, B, C from front to back, top to bottom, or left to right as viewed from the front.
- F. In Delta connected systems the "high" leg shall be the B phase and shall be clearly marked with an orange outer finish.
- G. Multi-Section Panelboards:
 - 1. Sub-feed conductors shall be the same size as the conductors feeding the main section.
 - 2. Circuiting originating in one section shall not pass through another section.
 - 3. Circuit conductors and grounding conductors shall originate in the same panelboard section.
 - 4. A separate isolated grounding conductor shall be installed from the main section to the sub-feed section(s).
 - 5. Where the panelboard is rated for service entrance equipment the sub-feed section shall have a separate isolated ground buss fed from the main section ground buss.
- H. Labeling:
 - 1. Each panelboard shall have an engraved phenolic plate permanently installed on the front of the panel with the panel name, current rating, and voltage rating.

2. Where there is more than one nominal voltage system the panel shall also have an engraved phenolic plate describing the means of identification used to identify the phase and system of each ungrounded conductor of the system served by the panel.
3. Plates shall be white with black lettering.
4. Panelboard circuit numbers shall be as indicated on the panelboard schedules.

3.26. LIGHTING CONTROL SYSTEM:

- A. The Lighting Control System shall be installed in strict accordance with the manufacturer's instructions and recommendations.
- B. System Startup:
 1. The Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all system components.
- C. Training:
 1. The Manufacturer shall provide factory authorized application engineer for a minimum of 8 hours on site to train owner personnel in the operation and programming of the lighting control system.
- D. Documentation
 1. Manufacturer shall provide system documentation including:
 2. System 1-line diagram showing all panels, number and types of switches and sensors.
 - a. Lighting Control Panel Schedules
 - b. Lighting Channel Schedule
 - c. Typical wiring diagrams for each component.
- E. Warranty
 1. Manufacturer shall provide a 1-year warranty for all system components. In addition a three(3) year extended warranty shall also be included.

3.27. PHOTOELECTRIC CELLS, TIMERS, AND CONTACTORS FOR LIGHTING CONTROL:

- A. Install time clocks where accessible.
- B. Install photoelectric cells so that lighting fixtures do not affect the cell.
- C. Adjust time clock(s) and photoelectric cells as required for proper operation.

3.28. DRY TYPE TRANSFORMERS:

- A. Flexible metallic conduit equipped with bare stranded copper ground jumper shall be provided for all transformer primary and secondary connections
- B. Transformer secondaries shall be grounded to the building steel and to the primary and secondary side conduit systems.

3.29. IDENTIFICATION AND LABELING:

- A. Feeder Designation:
 1. Non-ferrous identifying tags or pressure sensitive labels shall be securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switch gear and at termination of cables. Tags or labels shall be stamped or printed to correspond with markings on drawings so that feeder or cable number and phase can be readily identified.
 2. Where there is more than one nominal voltage system, each ungrounded system conductor shall be identified by phase and system wherever accessible per NEC. The means of identification shall be permanently posted at each branch-circuit panelboard.
- B. Color Coding of Conductors:
 1. The ungrounded (phase) conductors and the grounded (neutral) conductors of each voltage system shall be identified by the following color coding method:
 - a. 120/240 Volts, Single Phase, 3 Wire:
 - 1) Grounded (Neutral) Conductor --- White
 - 2) Ungrounded (Phase) Conductors --- Red, Black
 - a. 120/240 Volts, Three Phase, 4 wire:
 - 1) Grounded (Neutral) Conductor --- White
 - 2) Ungrounded (Phase) Conductors --- Red, Orange, Black
 - b. 120/208 Volts, 3 Phase, 4 Wire:

- 1) Grounded (neutral) Conductor --- White
 - 2) Ungrounded (phase) Conductors --- Black, Blue, Red
 - c. 277/480 Volts, 3 Phase, 4 Wire:
 - 1) Grounded (neutral) Conductor --- Gray
 - 2) Ungrounded (phase) Conductors --- Brown, Orange, Yellow
 2. Green shall be used for equipment grounding conductors only.
 3. The insulation color shall be visible for the entire length of wire.
- C. Panelboard:
1. Each Lighting and Power Panelboard shall contain a typed circuit directory listing all circuit breakers and the load served by each.
 2. Panelboard directories shall be typewritten and shall include adequate descriptions for proper identification of individual circuits. Do not write in or on panelboards.
 3. On Distribution panelboards, provide and install an engraved laminated label for each circuit, indicating circuit's number and load served.
 4. Each panelboard shall have an engraved phenolic plate permanently installed on the front of the panel with the panel name, current rating, and voltage rating.
 5. Where there is more than one nominal voltage system each panelboard shall have an engraved phenolic plate describing the means of identification used to identify each phase, neutral, and grounding conductors of the system served by the panelboard per NEC.
 6. Plates shall be white with black lettering.
- D. Wall Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on the wall plate.
- E. Receptacles: Install a label on the face of the coverplate and tags or wire markers inside the outlet box identifying the panelboard and circuit number from which the outlet is served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of coverplate- black print on clear tape on light colored or stainless-steel plates and white print on clear tape on dark colored plates. Embossed tape labels will not be accepted. Use durable wire markers or tags within outlet boxes.
- G. Disconnect Switches:
1. Install an engraved phenolic nameplate on the front of each switch enclosure identifying the equipment served by the safety switch and source of power (i.e., panel name and circuit number).
 2. Plates shall be white with black lettering.
 3. The plates shall be permanently installed with stainless steel screws or stainless-steel rivets. Plates installed with glue or other adhesives will not be accepted.
 4. Where motor rated switches are used as service disconnect switches, labeling shall be as described for receptacles.
- H. Junction boxes: Identify circuits enclosed in concealed junction boxes on the cover with permanent marking pen.
1. For power and lighting circuits indicate panelboard of origin and panelboard circuit number(s).
 2. For auxiliary systems circuiting indicate the system and zone served.
- I. Service disconnects:
1. An additional engraved sign shall be permanently attached next to panelboard circuit breakers, on enclosed circuit breaker enclosures, and/or on disconnect switches used as service disconnects to identify each main service disconnect.
 2. The sign shall be red with white lettering a minimum of ½" high.
 3. Where multiple main disconnects are utilized the labels shall identify each as one of a group, i.e., "Service Disconnect 1 of 3", etc. where there are three service disconnects.

3.30. FIRE ALARM SYSTEM:

- A. The installation shall be by a Certified Fire Alarm Contractor who has qualified and received a permit from the State Fire Marshal, with an NICET Level III on staff.

- B. All wiring shall be in accordance with the National Electric Code and the local code having jurisdiction.
- C. Unless otherwise specified, minimum wire size shall be 14 gauge for AC and power supply connections, 14 gauge for audible alarm and auxiliary circuits, and 18 gauge for signal initiating circuits. Diagrams shall be provided for device and power wiring. Color coding and permanent numbering shall be used as recommended by the equipment supplier.
- D. All system wiring shall be installed in metal raceway in accordance with Section "Raceways".
- E. Junction boxes shall have covers painted red with the letters "FA" stenciled on the cover in 2" high white letters.
- F. Auxiliary Remote Power Supplies/Notification Appliance Circuit Extender (NAC panel):
 - 1. Power supplies shall be sized at 133% of proposed load. Fire Alarm submittals shall include power supply capacity and loading data.
 - 2. Remote power supplies shall be supervised by the FACP.
 - 3. The power supplies shall be installed, accessible, below ceiling, in electrical rooms or where indicated on the drawings.
- G. Elevator Interface:
 - 1. Elevator Recall:
 - a. Provide all hardware and circuiting required for the elevator interface with the fire alarm system, elevator lobby smoke detector(s), and the elevator machine room smoke detector(s) to provide elevator recall.
 - b. Coordinate the requirements with the elevator equipment supplier/installer.
 - 2. Elevator Shut-down:
 - a. Install a heat detector within 2 feet of each fire sprinkler head in the elevator shaft for elevator shut down prior to sprinkler discharge.
 - b. Verify the number and locations of sprinkler heads prior to rough-in.
 - c. Provide all hardware and circuiting necessary to interface the fire alarm system with elevator feeder shunt trip circuit breaker or shunt trip power control module to provide elevator shut down.
- H. Provide circuiting as required for the interface with the kitchen hood fire suppression system and the fire alarm system.
- I. Where air handler shut down is controlled from the fire alarm system, the fire alarm system installer shall provide circuiting as required between the Duct Mounted Smoke Detectors and the HVAC interface/shut down relays. Circuiting connecting the relay output contacts to the HVAC control system shall be provided and installed by the Mechanical/Controls contractor.
- J. Each air handling unit shall be a separate fire alarm initiating zone.
- K. Install wire guards on all smoke detectors and notification devices installed in gymnasiums or similar use areas.
- L. **Install UL fire listed cellular communicator for monitoring of the fire alarm system. Provide all material and labor as needed for complete functioning system at the completion of construction.**
- M. Final connections to the Fire Alarm Control Panel **and Voice Panel** shall be made by a factory certified, NICET Level III, technician.
- N. A factory-trained representative of the manufacturer shall supervise connections and final testing of this system and shall complete a Certificate of Completion per NFPA 72. The Certificate of Completion shall be completely filled out and copies delivered to the Owner, Architect, and Engineer prior to the final inspection.
- O. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.
- P. **At the acceptance tests, contractor shall provide engineer with smoke detector diagnostic reports for all smoke detectors. All smoke detectors more than 10% dirty shall be either cleaned or replaced until test show value less than 10%.**

- Q. The fire alarm system shall be warranted free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy, whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.
- R. Identification and labeling:
1. Provide a framed building drawing identifying each zone and/or building area.
 2. Each building zone on the Fire Alarm Control panel shall relate to the building drawing in a manner that will direct the fire department to the area of a fire.
 3. On addressable systems each addressable device shall be given a name displayed on the control panel readout that will direct the fire department to the area of the fire, i.e. – South End of Zone(Building) 5; AHU-1 – Mechanical Room 201 – Building 2. Any room number reference shall be to final room numbers assigned to rooms on completion of construction.
 4. Building drawing, schedule of zones, and device identification schedule shall be submitted to the Engineer for approval prior to final inspection and acceptance.
 5. On addressable systems the contactor shall label each device with an alpha-numeric identifier that is unique to that device. This identifier shall correspond to the identifier programmed in the fire alarm control panel such that maintenance personnel may quickly and readily identify the device.

3.31. SECONDARY SURGE ARRESTERS:

- A. Secondary surge arresters shall be installed in strict accordance with the manufacturer's recommendations.
- B. Arrester may be mounted to the side of a surface mounted panelboard or trough. If such a surface is not available, the arrester shall be mounted on a bracket in its own flush mount enclosure located immediately adjacent to the service panel. Ensure that all leads are attached per manufacturer's recommendations. Excess lead length shall be cut off prior to making connections.

3.32. CONCRETE:

- A. The Electrical Contractor shall be responsible for placing concrete for electrical equipment pads, lighting standard bases, electrical equipment supports, and at other locations as indicated on the electrical drawings and/or specified herein.
- B. This Contractor shall be responsible for size, location, and orientation of the pads, bases, etc. Any required additions or modifications to concrete due to incorrect size, location, or orientation shall be the responsibility of this contractor.
- C. Concrete shall be cured for a period of not less than seven (7) days prior to setting poles, transformers, switchgear, motor control centers, or other pad mounted equipment.
- D. Forms shall be completely removed after concrete has cured and prior to setting equipment.
- E. A smooth wood float finish shall be given to exposed, unformed concrete.
- F. Honeycombed, or otherwise defective areas of concrete shall be repaired by patching with cement mortar.

3.33. BELL SYSTEM:

- A. Where 120-volt bells and interposing relays are required by long distances from the central controller, provide power from nearest convenience outlet circuit.
- B. 120-volt circuiting shall be installed in conduit.
- C. 24-volt cables routed above suspended ceilings shall be neatly bundled and supported with J-Hooks attached to the building structure a maximum of 4 feet on center. Cables shall not come-in-contact with conduits, ceilings, lighting fixtures, ductwork, or water, sewer, or steam piping and shall not be installed with data and telecommunications circuiting.
- D. Cables routed through finished spaces which do not have suspended ceilings shall be installed in conduit. Conduits shall be concealed above ceilings or in hollow spaces if possible. Routing of any exposed conduit shall be coordinated with the architect.

3.34. INTERCOM SYSTEM:

- A. Coordinate the locations of ceiling speakers with lighting fixtures and HVAC system devices and as close to where indicated as possible. Speaker baffles shall be pulled up tight against the ceiling tiles.
- B. Install Call-in switches in single gang outlet boxes where indicated on the plans.
- C. A cable must be run from each speaker to intercom control panel where shown. Cables shall be run in conduit.
- D. Cables shall be routed in EMT conduit from speaker outlets to above corridor ceiling.
- E. Cables above corridor ceilings:
 - 1. Cables shall be neatly bundled and supported with J-Hooks attached to the building structure a maximum of 4 feet on center.
 - 2. Intercom cables shall be installed on J-Hooks separate from all other auxiliary systems cables.
 - 3. Cables shall not come-in-contact with conduits, ceilings, lighting fixtures, ductwork, or water, sewer, or steam piping.
- F. Above inaccessible ceilings, cables shall be installed in EMT conduits. Conduits shall be terminated at each end with insulating bushings. Each end of conduit shall be easily accessible.
- G. Cables routed through finished spaces which do not have suspended ceilings shall be installed in conduit. Conduits shall be concealed above ceilings or in hollow spaces if possible. Routing of any exposed conduit shall be coordinated with the architect.

3.35. SPARE MATERIAL:

- A. Provide three exit/emergency combo signs and 50 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- B. Provide four emergency wall lights and 50 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- C. Provide six type NEMA 5-20R receptacles complete with 75 feet of circuiting in conduit . For each device provide complete with all additional labor and materials for installation in a location as directed by the architect or engineer.
- D. Provide two duplex communications outlets complete with all labor, material, cabling and conduit necessary to install outlet 300 feet from the nearest communications IDF closet and terminate outlet cables on patch panels in rack. Outlets to be installed in a location as directed by architect or engineer.
- E. Provide two of each type of fire alarm notification devices (speaker/strobe units, strobe only units) and 75 feet of circuiting in conduit for each device complete with all labor, programming, and material for installation in a location as directed by the engineer or architect.
- F. Provide four of each type of CO detector and 150 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- G. Provide two of each type of fire alarm heat detector devices and 75 feet of circuiting in conduit for each device complete with all labor, programming, and material for installation in a location as directed by the engineer or architect.
- H. Provide two of each type of initiating device (pull station, zone module, duct detector, smoke detector) and 75 feet of circuiting in conduit for each device complete with all labor and material for installation in a location as directed by the engineer or architect.
- I. Provide one spare set of fuses for each size and type fuse used.

3.36. EQUIPMENT TOUCHUP AND PAINTING:

- A. Clean damaged and disturbed areas on all painted surfaces of enclosures, cabinets, and equipment, sand smooth, and apply primer, intermediate, and finish coats of paint to suit the degree of damage at each location. Paint shall be the manufacturer's supplied touch up paint or a matching paint. Prep all surfaces to be painted by removing all rust, dirt, oil, and any other material that might inhibit good paint adhesion by mechanical means and/or with solvents.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
- C. Repair damage to galvanized finishes with two coats of zinc-rich paint recommended by manufacturer.
 - 1. Paint cut ends.
 - 2. Paint all drilled and punched holes.
 - 3. Paint all knicks and scratches.
 - 4. Paint all field cut conduit threads.
- D. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 16715

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. General Requirements/Provisions shall be considered a part of this section and shall have the same force as if printed herein full. In addition, all information related to communications infrastructure that is documented in the architectural, structural, mechanical, and electrical drawings/documents shall be considered as part of the communications documents.

1.02 QUALITY ASSURANCE

- A. Specifications, Standards and Codes: All work shall be in accordance with the following:

1. The current edition of the National Electrical Code (NFPA 70)
2. American National Standards Institute (ANSI)
3. National Electrical Manufacturers Association (NEMA)
4. Telecommunications Industries Association (TIA)
5. Electronic Industries Association (EIA)
6. Institute of Electrical & Electronics Engineers (IEEE)
7. Underwriters Laboratories (UL)
8. American Standards Association (ASA)
9. Federal Communications Commission (FCC)
10. Occupational Safety and Health Administration (OSHA)
11. American Society of Testing Material (ASTM)
12. Americans with Disabilities Act (ADA)
13. Local city and county ordinances governing electrical work
14. In the event of conflicts, the more stringent provisions shall apply.

1.03 SCOPE

- A. The work under this section of the specifications shall include furnishing labor, material and equipment required to provide a complete installation of the work indicated on the drawings or as specified herein.
- B. All material required to provide a fully operational system but not specifically mentioned or shown on the drawings, shall be furnished and installed without any additional charge.
- C. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the drawings and specifications, the more stringent shall be included, and the engineer shall be notified of the discrepancy.
- D. **All structured cabling that is routed thru underground conduits shall be outside plant rated.**

1.04 WORK INCLUDED

The Communications Infrastructure installed and work performed under this Division of the Specifications shall include but are not limited to the following:

- A. Data Cabling Infrastructure
- B. Wireless Access System Cabling
- C. Communications raceways, cable tray, ladder rack, racks and equipment mounting backboards

D. Grounding and Bonding

1.05 DEFINITIONS

- A. Terms: The following definitions of terms supplement those of the General Requirements and are applicable to Division 27 - Communications:
- B. Provide: As used herein shall mean "furnish, install and test (if applicable) complete."
- C. Infrastructure: As used herein shall mean cable, conduit, raceway, cable tray or j-hooks with all required boxes, fittings, connectors, and accessories; completely installed.
- D. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

1.06 DRAWINGS

- A. Drawings are diagrammatic and show the arrangement and location of pathways, outlets, support structures and equipment. The contractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, the contractor shall advise the engineer in writing for approval before proceeding with such work.
- B. Materials, equipment or labor not specifically indicated but required to form a complete system shall be provided. Drawings and Specifications do not indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.
- C. The right is reserved to make reasonable changes in locations of equipment indicated on drawings prior to rough-in without increase in contract cost.
- D. The contractor shall not reduce the size or number of conduit runs indicated on the drawings without the written approval of the Engineer.
- E. Any work installed contrary to contract drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- F. The location of equipment, support structures, outlets, and similar devices shown on the drawings are approximate only. Do not scale drawings. Obtain layout dimensions for equipment from Architectural plans unless indicated on communications plans.
- G. Verify the ceiling type, ceiling suspension systems, and clearance above ceilings prior to ordering cabling and associated hardware. Notify the engineer of any discrepancies.
- H. Review all architectural drawings for modular furniture layouts.

1.07 SUBMITTALS

- A. Submit for approval, manufacture specifications of all materials, equipment and systems to be furnished. Work shall not proceed without the Engineer's approval of the submitted items. Three (3) copies of the following shall be submitted:
 - 1. Submittal specification sheets for individual items for equipment assemblies that consist of more than one item or component shall be submitted. Each specification sheet shall be reviewed and sealed by contractors RCDD. Partial or incomplete submittals will not be considered, reviewed or stored, and such submittals will not be returned except at the request and expense of the contractor.
 - 2. Contractor shall generate shop drawings. Modify reviewed and accepted shop drawings to include revisions based upon completion of work. Submit shop drawings with record drawings on hard copy. Additionally, provide one electronic copy of shop drawings in both AutoCad format (.dwg file) and Visio format(.vsdx file). Failure to submit electronic file with drawings will be grounds for immediate rejection.

3. Shop drawings shall include equipment racks, patch panels, termination blocks, connection details, rack mounting details and any other details not included in the construction drawings. All Submittal drawings shall be prepared and sealed by the contractors RCDD for approval.
- B. Any materials and equipment listed that are not in accordance with specification requirements may be rejected.
- C. The approval of material, equipment, systems and shop drawings is a general approval subject to the drawings, specifications and verification of all measurements at the job. Approval does not relieve the Contractor from the responsibility of shop drawing errors. The contractor shall carefully check and correct all shop drawings prior to submission for approval.

1.08 QUALITY ASSURANCE

- A. Equipment and materials required for installation under these Specifications shall be the current model and new (less than one [1] year from the date of manufacture), unused and without blemish or defect.
- B. Equipment shall bear labels attesting to Underwriters Laboratories, where subject to label service. Manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and be able to furnish proof of their ability by submitting affidavits and descriptive data about their product including size and magnitude comparable to requirements specified herein.

1.09 CONTRACTOR QUALIFICATIONS

- A. The contractor shall have total responsibility for the coordination and installation of the work shown and described in the drawings and specifications. The contractor shall be a company specializing in the design, fabrication and installation of integrated communications systems.
- B. Communication systems specified shall be installed under the direction of a qualified Contractor. Qualification requirements shall include submittal by the contractor to the engineer of the following:
 1. List of five [5] previous projects of this scope, size and nature; including names and sizes of projects, description of work, time of completion and names of contact persons for reference.
 2. Certification of contractor's manufacturer-authorization to provide material, perform installation and provide a minimum 25 year manufactures warranty for work to be performed under this contract. This must be provided with submittals for approval.
- C. Contractor must have a Registered Communications Distribution Designer (RCDD) on staff. This individual must be a W-2 employee of data contractor. Various types RCDD contractors are not allowed for this project.
- D. Submit copy of contractor's RCDD Certificate and resume for verification and approval at time of submittal.
- E. All submittal documentation shall be prepared, sealed and signed by the contractors RCDD for approval.
- F. Contractor shall have a certified BICSI Technician present at all times during the installation and/or testing of the entire Structured Cabling System.
- G. Contractor must have an office regularly staffed on a daily basis with certified service and installation technicians within a 100 mile radius of the project site.

1.10 COORDINATION WITH OTHER TRADES

- A. The Contractor shall coordinate communications work with that of other sections as required ensuring that the entire communications work will be carried out in an orderly, complete and coordinated fashion.

1.11 PERMITS

- A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.
- B.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval, similar equipment of other manufacturers as substitution. The Engineer's decision as to whether the submitted equipment is acceptable shall be final and binding.
- B. All changes necessary to accommodate the substituted equipment shall be made at the contractor's expense and shall be as approved by the Engineer. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.
- C. If substitutions are made in lieu of devices specified; form, dimension, design and profile shall be submitted to the Engineer for approval.
- D. Submit request for approval of substitute materials in writing to the Engineer at least ten (10) days prior to bid opening for review.

2.02 MATERIALS

- A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories Inc. or certification by other recognized laboratory.
- B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.
- C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.
- D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.
- E. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 - EXECUTION

3.01 EXAMINATION OF CONDITIONS

- A. Prior to the start of work, the Contractor shall carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

- B. Install equipment in accordance with applicable codes and regulations, the original design and the referenced standards.
- C. In the event of a discrepancy, immediately notify the engineer in writing.
- D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.02 PROTECTION OF SYSTEMS AND EQUIPMENT

- A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.
- B. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.
- C. As determined by the engineer, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the contract documents.
- D. Damaged paint on any equipment or material shall be repainted to the same quality of paint, color, finish and workmanship as used by the manufacturer.

3.03 ACCESS TO EQUIPMENT

- A. Equipment shall be installed in a location and manner that will allow convenient access for maintenance and inspection.
- B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.
- C. Where the engineer determines that the contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the engineer, at no additional cost to the Owner. "Conveniently accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.

3.04 CLEANING

- A. During construction, and prior to Owner acceptance of the building, remove from the premises and dispose of all packing material and debris caused by communications work.
- B. Remove dust and debris from interiors and exteriors of all communications equipment.

3.05 COMPLETION

- A. General: Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.
- B. Results Expected: Systems shall be complete and operational and controls shall be set and calibrated. Testing, start-up and cleaning work shall be complete.
- C. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this specification shall be delivered to the Owner.

PART 4 – HORIZONTAL CABLING

4.01 APPROVED PRODUCTS

- A. Approved Horizontal Copper Cable Manufacturer(s)
 - 1. Berk-Tek

2. Systemax
3. Hitachi

4.02 HORIZONTAL COPPER CABLE

- A. 100 OHM Category 6 Balanced Twisted Pair Cable
 1. The horizontal balanced twisted pair cable shall meet or exceed the Category 6 transmission characteristics per issue of ANSI/TIA-568-C.2.
 2. Cable jacket shall be CMR or CMP rated (according to the space it occupies).
 3. All Category 6 cabling shall be equal to Berk-Tek LANmark-1000 Enhanced Category 6 cabling
 4. Jacket color shall be as shown on drawings.
 5. Provide plenum rated in all plenum areas on project.

4.03 HORIZONTAL CABLES

- A. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
- B. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.
- C. Cable raceways shall not be filled greater than the ANSI/TIA-569-B maximum fill for the particular raceway type.
- D. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
- E. Riser rated cable shall be installed in metallic conduit when installed in a plenum space.
- F. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
- G. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.
- H. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids, conduit, pipes, duct work or panels.
- I. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.
- J. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes or other control devices.
- K. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Contractor shall install appropriate carriers from the building structure to support the cabling.
- L. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.
- M. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA-568-C.2 document, manufacturer's recommendations and best industry practices.
- N. Leave a minimum of 12" of slack for twisted pair cables at the outlet. Cables shall be coiled in the outlet box, surface-mount box or modular furniture raceway if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.
- O. Cables shall be neatly bundled and dressed to their respective termination device. Each terminating device shall be fed by an individual bundle separated and dressed back to

- the point of cable entrance into the rack or frame.
- P. Each cable shall be clearly labeled on the cable jacket behind the termination device at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

PART 5 – BACKBONE FIBER OPTIC CABLING

5.01 APPROVED PRODUCTS

- A. Approved Optical Fiber Backbone Cable (Inside Plant) Manufacturer(s)
1. Berk-Tek 12 Strand OM3 50 µm Multi-Mode
 2. Equals by Systimax, General, & Hitachi
 3. Provide plenum rated in all plenum areas on project.
- B. Approved Optical Fiber Backbone Cable (Outside Plant) Manufacturer(s)
1. Berk-Tek 6 Strand OS2 Single Mode
 2. Equals by Systimax, General, & Hitachi

5.02 OPTICAL FIBER CONNECTOR ASSEMBLIES

- A. Multimode Fiber Connectivity
1. The optical fiber connectors shall be factory terminated LC for installation onto single mode fiber.
 2. The optical fiber connectors shall meet or exceed the performance criteria found in ANSI/TIA-568-C.3.
 3. The optical fiber connectors shall be compatible with 900-micron buffered fibers or 250-micron loose-tube fibers.
 4. All multimode fiber pigtail assemblies shall be installed by fusion splicing method only (No Exceptions).
 5. All fiber enclosures shall be equipped with slack storage trays or slack management spools.
 6. The loss of each connector shall not exceed 0.75 dB.
 7. The fiber adapter panels shall be type LC.
 8. The optical fiber adapter module that occupies the fiber patch panel shall be equipped with zirconia ceramic sleeve.

5.03 BACKBONE FIBER OPTIC CABLES (INSIDE PLANT)

- A. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1, manufacturer's recommendations and best industry practices.
- B. Backbone cables shall be installed separately from horizontal distribution cables
- C. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.
- D. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits
- E. Exposed cables must be OFCP rated if installed in an air return plenum. Riser rated cables shall be installed in metallic conduit if installed in an air return plenum.
- F. Where backbone cables and distribution cables are installed in a cable tray or wire way, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
- G. Leave 10' of slack on each end of fiber backbone cable.

- H. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
- I. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
- J. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.
- K. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.
- L. Each optical fiber cable shall be individually attached to the respective enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
- M. Each optical fiber cable shall be clearly labeled at the entrance to the enclosure. Cables labeled within the bundle shall not be acceptable.
- N. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
- O. A maximum of 24 strands of fiber shall be spliced in each tray
- P. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

5.04 BACKBONE FIBER OPTIC CABLES (OUTSIDE PLANT)

- A. All OSP cables brought to the Entrance Facilities shall have 15ft of slack coiled and secured to the wall in the proximity of the fiber enclosure.
- B. All cables shall be tagged and identified within each hand-hole/maintenance hole.
- C. Place initial cables in bottom conduits to facilitate easy subsequent cable placement.
- D. Place leader guard in the duct before placing cable to prevent damaging the cable sheath on the sharp edge of the duct.
- E. Ventilate maintenance where gas has been detected before entering the maintenance hole.
- F. To ensure that the optical fiber cable's qualities and characteristics are not degraded during installation, excessive pulling tensions and short bending radii will not be allowed. The maximum pulling tension is 600 lbs. The minimum bending radius for cable under tension is 20 times the outside diameter of the cable and for cable at rest is 10 times the outside diameter of the cable.
- G. A 600 lb. break-away swivel, along with a slip clutch capstan winch that shows the dynamometer (pulling tension) reading, shall be used at all times during pulling.
- H. Reels shall be continuously manned during cable installation.
- I. Cable coils shall have at least two points of support on the optical fiber racking system.
- J. When mounting the optical fiber slack coils, the minimum bend radius shall not be exceeded; this radius is equal to 10 times the outside diameter of the cable in a static application and 20 times the outside diameter in a dynamic application. At any time during the entire handling process of the optical fiber cable, as much care as possible should be maintained and all the manufacturer's recommendations should be followed.

5.05 OPTICAL FIBER CONNECTIVITY / SPLICING

- A. Optical fiber connectors shall be installed as per the requirements specified by the manufacturer's installation guidelines.
- B. All splicing shall be of the fusion type made under Light Injection and Detection Mode. The Contractor shall provide certified and experienced personnel for splicing.
- C. Contractor's tools and equipment shall be in excellent working order. Any worn or improperly working tools shall be discarded and not used on this project. All fusion splicers shall be calibrated and labeled according to the manufacturer's specifications. Contractor shall submit certification of calibration for the fusion splicers to the Engineer.

PART 6 – FACEPLATES AND CONNECTORS

6.01 APPROVED PRODUCTS

- A. Approved Copper Connectivity Manufacturer(s)
 - 1. Leviton
 - a) Cat 6 8P8C Connector Blue-Data Part #61110-RL6
 - b) Cat 6 8P8C Connector Green-WAP Part #61110-RV6
 - 2. Systimax
 - a) Cat 6 8P8C Connector Blue-Data Part #2291216-6
 - b) Cat 6 8P8C Connector Green-WAP Part #2291216-9
 - 3. Hubbell
 - a) Cat 6 8P8C Connector Blue-Data Part #HXJ6B
 - b) Cat 6 8P8C Connector Green-WAP Part #HXJ6GN
- B. Approved Faceplate Manufacturer(s)
 - 1. Leviton
 - a) 4 Port Stainless Steel Faceplate Part #43080-1L4
 - 2. Systimax
 - a) 4 Port Stainless Steel Faceplate Part #M14SP-L
 - 3. Hubbell
 - a) 4 Port Stainless Steel Faceplate Part #SSFL14
- C. Approved Surface Mount Box Manufacturer(s)
 - 1. Leviton 2 Port Surface Mount Housing Part #41089-2WP
 - 2. Systimax 2 Port Surface Mount Housing Part #M102SMB-B-262
 - 3. Hubbell 2 Port Surface Mount Housing Part #ISB2W

6.03 COPPER CONNECTIVITY

- A. Voice/Data Jacks
 - 1. Category 6, 8-Position, 8-Contact (8P8C) Modular Jack
 - A. The connector module shall meet or exceed the Category 6 performance criteria per ANSI/TIA-568-C.2.
 - B. The eight-position connector module shall accommodate six-position modular plug modular cords without damage to either the cord or the module.
 - C. The connector module shall be designed for use at the work area (WA), communications room (TR) and/or equipment room (ER) without modification.
 - D. The connector module shall be available in both the T568A and T568B wiring configurations within the same module.
 - E. The connector module shall have an insulation displacement connection featuring insulation slicing of 22 to 24 AWG plastic-insulated solid copper conductors forming a gas-tight connection.
 - F. Jack/Icon colors shall be:
 - 1. Blue for Data
 - 2. Green for Wireless Access Points
 - 3. Orange for Security Cameras

6.04 FACEPLATES

A. Faceplates

1. The faceplate housing the connector modules shall have no visible mounting screws.
2. The faceplate shall have a labeling capability using built-in labeling windows, to facilitate outlet identification and ease network management.
3. The faceplate shall provide flexibility in configuring multimedia workstation outlets that respond to present or future network application needs.
4. Each faceplate shall have a minimum of (4) ports per each outlet location. Each unpopulated port shall have a blank module installed that matches the color of the faceplate.
5. Faceplates shall be stainless steel unless noted otherwise. All faceplates shall match electrical outlet covers. Verify color and size of each faceplate prior to ordering.

6.05 SURFACE MOUNT BOXES

- A. The surface mount box shall be sized to accommodate the quantity of outlets per each location as required.
- B. A surface mount box shall be provided at each of the following locations: Projector, Wireless Access Point and/or any outlet location serving a ceiling mounted device.
- C. Provide a minimum of 15ft of slack at each ceiling mounted outlet location. Slack loop shall be coiled up neatly and placed on a j-hook to support cable.
- D. Verify location with owner prior to mounting.

6.06 COPPER CONNECTIVITY

- A. 8-position, 8-contact (8P8C) modular jacks shall be installed in accordance with manufacturer's recommendations and installation guides, and best industry practices.
- B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
- C. All outlet locations shall have color-coded 8P8C modular jacks installed. No cable shall be left unterminated.

6.07 FACEPLATES

- A. Blank inserts shall be installed where ports are not used.
- B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.
- C. Faceplates shall be installed straight and level.
- D. Faceplates shall be installed at the same heights as electrical outlets.

6.08 SURFACE MOUNT BOXES

- A. Blank inserts shall be installed where ports are not used.
- B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.
- C. Surface mount boxes shall be installed straight and level.
- D. Surface mount boxes shall be installed in an accessible area.

PART 7 – PATCH PANELS AND FIBER OPTIC ENCLOSURES

7.01 APPROVED PRODUCTS

- A. Approved Patch Panel Manufacturer(s)
 1. Leviton

- a) 24 Port Patch Panel Part #49255-L24
 - b) 48 Port Patch Panel Part #49255-L48
 - 2. Systemax
 - a) 24 Port Patch Panel Part #M2000-1U
 - b) 48 Port Patch Panel Part #M2000-2U
 - 3. Hubbell
 - a) 24 Port Patch Panel Part #UDX24E
 - b) 48 Port Patch Panel Part #UDX48E
- B. Approved Optical Fiber Enclosure Manufacturer(s)
 - 1. Leviton
 - a) 1RU Rack Mount Fiber Enclosure Part #5R1UM-S03
 - b) 2RU Rack Mount Fiber Enclosure Part #5R1UM-S06
 - c) 4RU Rack Mount Fiber Enclosure Part #5R1UM-F15
 - 2. Systemax
 - a) 1RU Rack Mount Fiber Enclosure Part #760147439
 - b) 2RU Rack Mount Fiber Enclosure Part #760147447
 - c) 4RU Rack Mount Fiber Enclosure Part #760147454
 - 3. Hubbell
 - a) 1RU Rack Mount Fiber Enclosure Part #FCR1U3SP
 - b) 2RU Rack Mount Fiber Enclosure Part #FCR2U6SP
 - c) 4RU Rack Mount Fiber Enclosure Part #FCR4U15SP
- C. Approved Termination Block Manufacturer(s)
 - 1. Leviton
 - 2. Systemax
 - 3. Hubbell
- D. Category 6 Patch Panel
 - 1. The Category 6 patch panel shall be compatible with 19" equipment racks, cabinets or wall mount brackets.
 - 2. The Category 6 patch panels shall be 24 or 48 port unloaded patch panels.
 - 3. The Category 6 patch panels shall be sized to accommodate one port for each cable installed plus 25% spare capacity for future growth. All ports shall be filled with a removable 8-position color coded modular jacks for each system. No port shall be left empty or blank.
 - 4. The Category 6 patch panel shall be equipped with removable 8-position modular jacks color coded for each system and shall allow for termination of both T568A and T568B wiring schemes.
 - 5. Data and WAP cabling shall not occupy the same patch panel. All cabling for each system shall be installed in separate patch panels with color coded modular jacks to match as specified.
 - 6. The Category 6 patch panel shall be equipped with front labeling windows to facilitate port identification.
 - 7. The connector module shall meet or exceed the Category 6 performance criteria per ANSI/TIA-568-C.2.

7.02 OPTICAL FIBER PANELS/ENCLOSURES

- A. Rack Mount Optical Fiber Enclosure
 - 1. The rack mount optical fiber enclosure shall be equipped with a sliding drawer to access fibers.

2. The rack mount optical fiber enclosure shall be capable of terminating tight-buffered or loose tube optical fiber cable.
3. The rack mount optical fiber enclosure shall provide for bend radius control throughout the panel as well as storage space for slack cabling.
4. The panel/enclosure shall meet or exceed the performance criteria per ANSI/TIA-568-C.3.
5. The rack mount optical fiber panel/enclosure shall be equipped with optical fiber cassettes.
 - A. The optical fiber adapter panels shall accommodate multimode terminated optical fiber.
 - B. The optical fiber adapter panels shall be compatible with LC OM3 connectors.
 - C. Multimode adaptors shall be beige in color and equipped with zirconia ceramic sleeves.

7.03 PATCH PANELS

- A. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1, manufacturer's recommendations and best industry practice.
- B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
- C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- D. Cables shall be neatly bundled and dressed to their respective patch panel. Each patch panel shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- E. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

7.04 OPTICAL FIBER PANELS/ENCLOSURES

- A. Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568-C.0 and/or ANSI/TIA-568-C.1, manufacturer's recommendations and best industry practices.
- B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
- C. Bend radius of the optic fiber cable in the enclosure shall not exceed 10 times the outside diameter of the cable.
- D. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
- E. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
- F. A maximum of 24 strands of fiber shall be spliced in each tray
- G. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

PART 8 – PATCH CORDS

8.01 APPROVED PRODUCTS

- A. Approved Copper Patch Cord Manufacturer(s)
 1. Leviton
 - a) Cat 6 Patch Cord Blue-Data Part #62460-XXL

- 2.
 - b) Cat 6 Patch Cord Green-WAP Part #62460-XXG
 - Systemax
 - a) Cat 6 Patch Cord Blue-Data Part #UNC6-BL
 - b) Cat 6 Patch Cord Green-WAP Part #UNC6-GR
- 3.
 - Hubbell
 - a) Cat 6 Patch Cord Blue-Data Part #HC6BXX
 - b) Cat 6 Patch Cord Green-WAP Part #HC6GNXX

8.02 COPPER PATCH CORDS

A. Category 6 Patch Cords

- 1. Copper patch cords shall be installed as per the requirements specified by the manufacturer's installation guidelines.
- 2. The Category 6 patch cord shall be 4-pair, with 24 AWG solid or stranded copper conductors and 8-position modular plug.
- 3. The Category 6 modular cord cable shall be UL Listed as Type CMR.
- 4. The Category 6 patch cord shall meet or exceed the requirements of ANSI/TIA-568-C.2.
- 5. Lengths shall be 3', 5', 7' and/or 10' as required by the Owner.
- 6. Provide one patch cord for every cable installed that will be utilized for patching between patch panel and switches. Verify length and color with Owner prior to ordering.
- 7. Provide one patch cord for every cable installed at each work area outlet. Verify length and color with Owner prior to ordering.
 - A. The Category 6 patch cord color shall be as indicated on drawings.

8.03 FIBER PATCH CORDS

A. 50 μ m Multi-Mode Fiber Patch Cord (OM3)

- A. Fiber patch cords shall be installed as per the requirements specified by the manufacturer's installation guidelines.
- B. The optical fiber cord connector shall be LC.
- C. Lengths shall be 1m, 2m, and/or 3m as required by the application.
- D. Provide a minimum of (6) OM3 fiber optic patch cords per each IDF and a minimum of (6) OM3 fiber optic patch cords in the MDF. Verify length with Owner prior to ordering.

PART 9 – EQUIPMNET RACKS AND ENCLOSURES

9.01 APPROVED PRODUCTS

A. Approved Equipment Rack/Cabinet Manufacturer(s)

- 1. Chatsworth Products, Inc.
 - a) 2-Post Floor Mounted Equipment Rack Part #48353-703
 - b) 4-Post Adjustable Server Rack Part #15213-703
- 2. Hoffman
 - a) 2-Post Floor Mounted Equipment Rack Part #EDR19FM45U
 - b) 4-Post Floor Mounted Server Rack Part #E4DRS19FM45U
 - c) Wall Mount Equipment Rack Part #E19SWM25U24
- 3. Middle Atlantic

9.02 EQUIPMENT RACKS/CABINETS

A. Equipment Racks

1. The equipment rack shall be constructed of high strength, lightweight aluminum.
2. The vertical rails of the equipment rack shall be equipped with the EIA hole pattern.
3. 2 Post rack shall be: 7'H x 19"W floor mounted. Vertical channels shall be drilled and taped.
4. 4 Post rack shall be: 7'H with adjustable depth of 26-inches to 38-inches. Vertical channels shall have square punched mounting holes. Provide additional equipment mounting hardware, per each rack installed, to owner upon completion of the installation.
5. Provide a minimum of (50) 12X24 cage nuts with (50) 12X24 rack screws per each 4-Post rack and a minimum of (50) 12X24 rack screws per each 2-Post or wall mount rack provided/installed.
6. Rack color shall be black.

9.03 EQUIPMENT RACKS/CABINETS

- A. Equipment racks shall be securely attached to the concrete floor using minimum 3/8" hardware or as required by local codes.
- B. Equipment racks shall be installed as per the requirements specified by the manufacturer's installation guidelines.
- C. Equipment racks shall be placed with a minimum of 36-inch clearance from each of the corresponding walls: front, rear and one side of the rack or as indicated on Drawings.
- D. All equipment racks shall be grounded to the telecommunications ground bus bar.
- E. Mounting screws not used for installing patch panels and other hardware shall be bagged and left with the rack or turned over to the owner upon completion of the installation.

9.04 BACKBOARDS

- A. Backboards shall be 3/4" void free plywood. Size of backboard shall be 4' x 8' mounted vertically 18" A.F.F. unless otherwise noted differently on Drawings. Backboards shall be painted with two (2) coats of gray fire-retardant paint.

PART 10 – CABLE MANAGEMENT AND LADDER RACK

10.01 APPROVED PRODUCTS

A. Approved Horizontal Cable Management Manufacturer(s)

1. Chatsworth Products, Inc.
 - a) 2RU Horizontal Cable Manager Part #35441-702
2. Leviton
 - a) 2RU Horizontal Cable Manager Part #492RU-HFR
3. Systimax Equal
4. Hubbell Equal

B. Approved Vertical Cable Management Manufacturer(s)

1. Chatsworth Products, Inc.
 - a) 6" Vertical Cable Manager Part #35521-703
 - b) 8" Vertical Cable Manager Part #35522-703
2. Leviton
 - a) 6" Vertical Cable Manager Part #4980L-VFR

- b) 8" Vertical Cable Manager Part #8980L-VFR
- 3. Systemax Equivalent
- 4. Hubbell Equivalent

C. Approved Ladder Rack System Manufacturer(s)

- 1. Chatsworth Products, Inc.
 - a) 12" Ladder Rack Part #11275-712
 - b) 18" Ladder Rack Part #11275-718
- 2. Hoffman
 - a) 12" Ladder Rack Part #LSS12BLK
 - b) 18" Ladder Rack Part #LSS18BLK
- 3. Middle Atlantic

D. Approved Tie Wrap/Velcro Strap Manufacturer(s)

- 1. Leviton
- 2. Or Approved Equal

10.02 CABLE MANAGEMENT - HORIZONTAL

A. Horizontal Cable Management

- 1. The horizontal wire manager shall be compatible with 19-inch equipment racks, cabinets or wall mount brackets.
- 2. The horizontal cable manager shall be double-sided to provide support/management for patch cords at the front of the panel and support/management of cables at the rear of the panel.
- 3. The horizontal cable manager shall be equipped with removable front and covers
- 4. The horizontal cable manager shall be 2 rack-units in height, installed above and below each patch panel and each switch as indicated on drawings.
- 5. Horizontal cable managers shall be black.

10.03 CABLE MANAGEMENT - VERTICAL

A. Vertical Cable Management

- 1. The vertical cable manger shall be 80" high double-sided, installed on both sides of all racks.
- 2. The vertical cable manager shall provide support/management for patch cords at the front of the rack and support/management of cables at the rear of the rack.
- 3. Vertical cable managers shall be installed on both sides of a single equipment rack. Where two (2) or more racks are positioned in a row, vertical cable managers shall be installed between each rack and each end of the row.
- 4. The vertical cable manager shall be a minimum width of 6".
- 5. Vertical cable manager color shall be black.

10.04 LADDER RACK

A. Ladder Rack System

- 1. See Drawings for ladder rack system details.
- 2. The ladder rack system shall be securely mounted with hardware (triangle brackets, top mounting plates, junction splice kits, butt splice kits, end caps, radius drop kits, etc.) designed for use with ladder rack systems per manufactures recommendations.

3. Ladder rack shall be 12" or 18" wide as indicated on drawings.
4. End caps shall be installed on the exposed ends of the ladder racks and channel supports. Protective covers shall be installed on threaded rods that come in contact with cabling plant.
5. All sections of ladder rack shall be properly grounded to the corresponding telecommunications ground bus bar in each communications room.
6. Ladder Rack System color shall be black.

10.05 TIE WRAPS AND VELCRO STRAPS

A. Tie Wraps and Velcro Straps

1. Tie wraps/Velcro straps installed in air handling spaces must be plenum rated.
2. Backbone cables shall be fastened to support structures with tie wraps/Velcro straps.
3. Horizontal cables shall be fastened to support structures with Velcro straps.
 - A. Tie Wraps shall be plenum rated red in color.
 - B. Velcro Strap color shall be black.
4. Tie wraps/Velcro straps shall be installed around cables at intervals of 12" minimum.
5. Tie wraps shall secure cables to ladder racks using an "X" pattern.
6. Do not over-cinch cables.

10.06 D-RINGS

A. D-rings

1. D-Rings shall be used on backboards to support cables, patch cords and cross-connect wire.
2. D-Rings shall be made of high-strength, fire-retardant material with rounded edges to prevent damage to cable and wire insulation.
3. Provide D-Rings of appropriate size and quantity for proper cable management and support as required.
4. D-Rings shall be installed on 3/4" backboard, straight and level.

10.07 LADDER RACKS

- A. Ladder rack system shall be installed straight, level and perpendicular to walls and ceiling slabs.
- B. Ladder racks shall be supported at 4' intervals maximum.
- C. Provide all hardware, accessories, fasteners, anchors, threaded rods and support channels required to provide a complete ladder rack system.
- D. Provide ladder rack system at minimum on (2) adjacent walls in each communications room or as indicated on drawings.
- E. See Drawings for ladder rack system details.

PART 11 – PATHWAYS

11.01 APPROVED PRODUCTS

- A. Approved Cable Tray System Manufacturer(s)
 1. Hoffman Quick Tray Pro Part #QTP4X18
 2. Wire Basket Tray Part #WBT4X18

3. Or Approved Equal
- B. Approved Cable Hanger Manufacturer(s)
1. Erico Products – Caddy HP Series
 2. Hoffman
 3. Or Approved Equal

11.02 COMMUNICATIONS OUTLET BOXES

- A. Outlet boxes and device covers shall be galvanized steel not less than 1/16" thick.
- B. The dimensions of the outlet box shall be 4" x 4" square with a minimum depth of 2-1/8".
- C. Outlet boxes shall be equipped with single gang device covers. Where installed in plaster, gypsum board, etc., covers shall be raised to compensate for the thickness of the wall finish.
- D. Where outlet boxes are to be empty for future use, blank cover plates shall be used.

11.03 CABLE TRAY

- A. Cable Tray System
1. Cable tray shall be aluminum construction.
 2. Cable tray cross members shall be factory welded at 12" intervals maximum.
 3. Cable tray shall be equipped with one (1) or two (2) support rails that run the length of each segment.
 4. End caps shall be installed on the exposed ends of the cable tray, channel supports and bolts. Protective covers shall be installed on threaded rods that come in contact with cabling plant.
 5. Wall mount cable tray used in limited clearance areas shall be hook style and constructed of aluminum.
 6. Provide all cable tray hardware accessory assemblies required to properly install cable tray system per manufactures requirements.
 7. See Drawings for cable tray dimensions.

11.04 CABLE HANGERS

- A. J-Hooks
1. J-hooks shall provide sufficient width to comply with required bend radii of high-performance cables. J-hook shall be cULus Listed.
 2. J-hooks shall have flared edges to prevent damage while installing cables.
 3. J-hooks sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.

11.05 CABLE TRAY SYSTEM

- A. Install trays in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of the NEC.
- B. All open trays shall be installed a minimum of six (6) inches away from any light fixture.
- C. Provide external grounding strap at expansion joints, sleeves, crossover and other locations where tray continuity is interrupted.
- D. Support all pathways from building structure. Do not support pathways from ductwork, piping or equipment hangers.
- E. Install cable tray level and straight.

- F. Provide all hardware, accessories, fasteners, anchors, threaded rods and support channels required to provide a complete cable tray system.
- G. Cable trays shall not be used to house both low voltage and power cables unless cables are separated by a grounded physical barrier.
- H. Cable tray system shall be grounded in accordance with ANSI/TIA-607-B.

11.06 CABLE HANGERS

- A. Installation and configuration shall conform to the requirements of ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 & ANSI/TIA-569-B, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer's installation instructions.
- B. Install cables using techniques, practices, and methods that are consistent with Category 6 or higher requirements and that supports Category 6 or higher performance of completed and linked signal paths, end to end.
- C. Install cables without damaging conductors, shield, or jacket.
- D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
- E. Pull cables without exceeding cable manufacturer's recommended pulling tensions. Use pulling means that will not damage media.
- F. Do not exceed load ratings specified by manufacturer.
- G. Adjustable non-continuous support sling shall have a static load limit of 100 lbs.
- H. To avoid electromagnetic interference (EMI), pathways shall provide minimum clearances of four feet from motors or transformers, one foot from conduit and cables used for electrical power distribution, and five inches from fluorescent lighting. Pathways shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.

PART 12 – GROUNDING AND BONDING

12.01 APPROVED PRODUCTS

- A. Approved Grounding Lug Manufacturer(s)
 - 1. Harger
 - a) 2 Hole Compression Lugs Part #GECLB62A
 - 2. Hoffman
 - a) 2 Hole Compression Lugs Part #DGCL61
 - 3. Or Approved Equal
- B. Approved Grounding Busbar Manufactures(s)
 - 1. Harger
 - a) Wall Mount TMGB Ground Bar Part #GBI14412TMGB
 - b) Wall Mount TGB Ground Bar Part #GBI14212TGB
 - c) Rack Mount Ground Bar Part #RGBHKIT14119.25
 - 2. Hoffman
 - 3. Or Approved Equal
- C. Approved OSP Cable Shield Bond Connector Manufacturer(s)
 - 1. 3M
 - a) Shield Bond Connector Part #4460-S
 - 2. Or Approved Equal

12.02 GROUNDING CONDUCTORS

- A. Grounding Conductor

1. Construction shall be Type THHN copper conductors, insulated with heat and moisture resistant PVC over which a UL listed jacket is applied.
2. Jacket color shall be green.

12.03 GROUNDING LUGS

A. Grounding Lugs and Hardware

1. Grounding lugs shall be 2-hole compression type irreversible. Stainless steel bolts and washers shall be used to install lugs to equipment and grounding bus bars.

12.04 GROUNDING BUSBARS

A. Grounding Busbar

1. The grounding busbar shall be made of 1/4" thick solid copper.
2. The grounding busbar shall be installed with minimum clearance, 1" offsets and 1-1/2" insulators.
3. The grounding busbar shall accommodate 2-hole compression lugs.
4. The grounding busbar shall meet or exceed ANSI/TIA-607-B requirements.

12.05 GROUNDING

- A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all communications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA-607-B Telecommunications Bonding and Ground Standard.
- B. The main entrance facility/equipment room (EF/ER or MDF) in each building shall be equipped with a telecommunications main grounding busbar (TMGB). Each telecommunications room (TR or IDF) shall be provided with a telecommunications ground busbar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility.
- C. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the EF, ER, or TR shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression lugs.
- D. All wires used for communications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with green tape. All cables and busbars shall be identified and labeled in accordance with the ANSI/TIA-606-A.

PART 13 - LABELING

13.01 LABELING REQUIREMENTS

- A. Labeling shall be done in accordance with the recommendations made in the ANSI/TIA-606-A document, manufacturer's recommendations and best industry practices.
- B. All spaces, pathways, outlets, cables, termination hardware, grounding system and equipment shall be labeled with machine-generated labels.
- C. All labels shall be clear with black text.
- D. All cables shall be labeled with machine generated, wrap around labels. Handwritten

- labels will not be accepted.
- E. A total of three (3) labels per horizontal cable are required at the following intervals: 6" from outlet; 18" from outlet; 12" from termination block/patch panel.
 - F. Labeling scheme shall be alphanumeric. Verify labeling scheme requirements with Owner prior to installation.

PART 14 - TESTING

14.01 TESTING REQUIREMENTS

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA-568-C.0, ANSI/TIA-568-C.1 and/or ANSI/TIA-1152. All conductors/strands of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors/strands in all cables installed.

B. Copper Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category 6 performance. Horizontal balanced twisted pair cabling shall be tested using a level IIe, III, or IV test unit for category 6 performance compliance.
2. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. The test shall be recorded as pass/fail as indicated by the test unit and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA-568-C.2 Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

C. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices unless clearly defined in the RFP and/or Drawings. These tests also include continuity checking of each fiber.
2. Fiber
 - A. Test the optical fiber cable bi-directionally with an OTDR and uni-directionally with a power meter/light source. Fiber must be tested at both 850nm and 1300nm. Maximum attenuation dB/Km @ 850nm/1300nm shall be 3.5/1.5. Maximum attenuation per connector pair shall be .75 dB. Attenuation testing shall be performed with a stable launch condition using a one-meter or two-meter jumper, equipped with

an built in Encircled Flux module provided by the test equipment manufacture, to attach the light source to the cable plant. The Encircled Flux jumper assembly shall remain connected to the light source after calibration and during all test measurements. Test set-up and performance shall be conducted in accordance with ANSI/TIA-568-C.3, TIA-TSB-4979 and to the manufacturer's application guides.

- B. All fiber optic stands shall be tested utilizing the "Method B" one jumper reference.

D. Coaxial Testing

1. Sweep testing of each reel of coaxial cable shall be performed over the 5 MHz through 1 GHz range by the cable manufacturer for transmission and structural return loss and be so certified in writing by the cable manufacturer.
2. Verification testing with a verification field test instrument will determine shorts, continuity, termination location and length of cable.
3. Approved testers are as follows:
 1. Fluke DTX
4. Signal strength measurement shall be performed with a field strength meter.
5. Signal level at each outlet will be +5 dBmv, + 3 dB.
6. Approved signal strength meters are as follows:
 1. Acterna
 2. Sadelco
 3. Promax

E. Test Results

1. Test documentation shall be provided on disk as part of the as-built package. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation," the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair (or strand) and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle will be required on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
2. The field test equipment shall meet the requirements of ANSI/TIA-568-C.2, ANSI/TIA-568-C.3, and/or ANSI/TIA-1152.
3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. Alternately, the Contractor may furnish this information in electronic form (CD). These CDs shall contain the electronic equivalent of the test results as defined by the Specification and be of a format readable from Microsoft Word.
4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

PART 15 – DOCUMENTATION, AS-BUILTS, TRAINING AND RECORDS

15.01 DOCUMENTATION & AS-BUILTS

- A. As-Built record documentation for communications work shall include:

1. Cable routing and identification
 2. System function diagrams
 3. Manufacturers' description literature for equipment
 4. Connection and programming schedules as appropriate
 5. Equipment material list including quantities
 6. Spare parts list with quantities if required.
 7. Details not on original Contract Documents
 8. Test results
 9. Warranties
 10. Release of liens
- B. The Contractor shall provide and maintain at the site a set of prints which shall accurately show the actual installation of all work under this section, indicating any variation from contract drawings, including changes in pathways, sizes, locations and dimensions. All changes shall be clearly and completely indicated as the work progresses.
- C. Progress prints shall be available for inspection by the Owner or any of his representatives and may be used to determine the progress of communications infrastructure work.
- D. At the completion of the work, prepare a new set of as-built drawings, of the work as actually noted on the marked-up prints, including the dimensioned location of all pathways.
- E. Furnish as-built drawings and documentation to the Project Manager. As-built drawings shall be generated in AutoCad 2006 or later and Visio formats. Submit as-built drawings electronically on C.D. and hard copy.

15.02 OPERATIONS AND MAINTENANCE MANUAL

- A. After completion of the work, the Contractor shall furnish and deliver to the Engineer three (3) copies of a complete Operations & Maintenance Manual. A system wiring diagram shall be furnished for each separate system.
- B. The manual shall be subdivided into separate sections with tab dividers to identify subsystems of the integrated system. Reference appropriate Specification sections.
- C. Provide the following additional information for each electronic system. Information shall be edited for this project where applicable.
1. Point-to-point diagrams, cabling diagrams, construction details and cabling labeling details

15.03 TRAINING

- A. The Contractor shall be responsible for training of facility personnel. Training shall take place after occupancy and before acceptance and shall include programs for on-site operations and maintenance of technology and communications systems. Training shall be held at the Owner's site and shall be of sufficient duration and depth to ensure that the trained personnel can operate the installed systems and can perform usual and customary maintenance actions.

15.04 WARRANTY

- A. General
1. All equipment is to be new and warranted free of faulty workmanship and damage.
 2. Replacement of defective equipment and materials and repair of faulty workmanship within 24 hours of notification, except emergency conditions (system failures), which must be placed back in service within eight (8) hours of

notification, all at no cost to the Owner.

3. The minimum warranty provisions specified shall not diminish the terms of individual equipment manufacturer's warranties.

B. Voice & Data Structured Cabling

1. Manufacturer(s) shall provide a minimum 25-year warranty for components used in the installed Structured Cabling System. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.
2. Contractor shall provide a 1-year material, labor and workmanship warranty on all products installed under this contract against any defects. Defective and/or improperly installed products shall be replaced and/or correctly installed at no cost to the Owner.

END OF SECTION