

ARCHITECT'S JOB NO. 22-10

DATED: July 8, 2022

COPY NO: _____

**ADDITION AND RENOVATIONS TO CAFETERIA
AT SALTER ELEMENTARY SCHOOL
PSCA NO. 9374**

OWNER

**TALLADEGA CITY BOARD OF EDUCATION
501 SOUTH STREET EAST
TALLADEGA, AL 35160**

SCHOOL BOARD MEMBERS

SANDRA BEAVERS	Board Member
ALLISON EDWARDS	Board Member
JAKE MONTGOMERY	Board Member
CHUCK ROBERTS	Board Member
JAMES BRASWELL	Board Member

DR. QUENTIN J. LEE

Superintendent



**LATHAN
ARCHITECTS**

LATHAN • BRYANT • CALMA

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AT SALTER ELEMENTARY SCHOOL
Job No. 22-10**

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NOTE: This Index is for convenience only. Its accuracy and completeness are not guaranteed, and it is not to be considered part of the Specifications. In case of discrepancy, the Specifications shall govern. Certain items may be included by means of notes on the Drawings; such items are not necessarily covered in the Specifications. Contractor shall verify all existing conditions and all dimensions at the project site.

TEAM LIST
ADDITION AND RENOVATIONS TO CAFETERIA AT SALTER ELEMENTARY SCHOOL
Architect Job No. 22-10

OWNER: TALLADEGA CITY BOARD OF EDUCATION
501 South Street East
Talladega, AL 35160

CIVIL: LBYD, INC.
880 Montclair Road, Suite 600
Birmingham, AL 35213
Project Engineer: Chris Harkins

ARCHITECT: LATHAN ASSOCIATES ARCHITECTS, P. C.
300 Chase Park South Suite 200
Hoover, AL 35244
Phone: 205-988-9112
Ryan Vernon, AIA

STRUCTURAL: STRUCTURAL DESIGN GROUP
300 Chase Park South, Suite 125
Hoover, AL 35244
Project Engineer: Craig Winn

MECHANICAL: WHORTON ENGINEERING, INC.
P.O. Box 5190
Anniston, AL 36205
Project Engineer: Randall Whorton

ELECTRICAL: STEWART ENGINEERING
300 East 7th Street
Anniston, AL 36202
Contact: Shawn Crawford

LIST OF DRAWINGS
ADDITION AND RENOVATIONS TO CAFETERIA AT SALTER ELEMENTARY SCHOOL
Architect Job No. 22-10

DRAWINGS INDEX (SET 11 TOTAL SHEETS)

GENERAL (1 SHEET)

T1.0 TITLE AND INDEX

CIVIL (6 SHEETS)

C0.1 CIVIL NOTES
C1.0 SITE DEMOLITION PLAN
C2.0 SITE LAYOUT AND UTILITY PLAN
C3.0 GRADING PLAN
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LIST OF DRAWINGS
ADDITION AND RENOVATIONS TO CAFETERIA AT SALTER ELEMENTARY SCHOOL
Architect Job No. 22-10

DRAWINGS INDEX (SET 45 TOTAL SHEETS)

GENERAL (1 SHEET)

T1.0 TITLE AND INDEX

CIVIL (6 SHEETS)

C0.1 CIVIL NOTES
C1.0 SITE DEMOLITION PLAN
C2.0 SITE LAYOUT AND UTILITY PLAN
C3.0 GRADING PLAN
C4.0 EROSION CONTROL PLAN
C5.0 CIVIL DETAILS

ARCHITECTURAL (11 SHEETS)

A1.1 LIFE SAFETY PLAN AND DEMOLITION PLAN
A2.1 FLOOR PLAN AND PLAN DETAIL
A2.2 ROOF PLAN AND ROOF DETAILS
A2.3 DOOR AND WINDOW SCHEDULE AND DETAILS
A2.4 ROOF DETAILS
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A3.2 BUILDING SECTIONS AND WALL SECTION
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S1.4 TYPICAL DETAILS
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S2.2 ROOF FRAMING PLAN
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S3.3 SECTIONS AND DETAILS

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M2.1	HVAC DETAILS
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QUALIFYING CONDITIONS FOR GENERAL CONTRACTORS:

The following conditions and terms may be required upon Owner's request and it shall be each Contractor's responsibility to ensure that they meet the minimum requirements set forth.

General Contractors wishing to bid on this school project shall meet the following minimum provisions regarding responsibility, in addition to all other requirements listed herein: Contractor shall have constructed not less than one educational project of similar size and complexity within the last five (5) years, with similar costs prorated for construction cost increases and Contractor shall be capable of 100% bonding of materials and 100% bonding of labor. All General Contractors wishing to bid shall have a minimum of five (5) years of experience doing business under the same firm name in which the bids are submitted. Joint venture contracts will not be approved.

Each General Contractor shall submit a list of all educational projects within the last five years and a statement from the Owners certifying faithful performance that construction completion was, or will be, obtained without protracted delay and/or defective work for the project. Full explanation should be submitted for any delayed completion. Inexperienced or non-responsible contractors are precluded from bidding and award.

Each General Contractor shall submit names and qualifications of main construction personnel to be placed on this project. The proposed project superintendent and the project manager shall have a minimum of five (5) years of work experience in their respective positions in managing and constructing projects similar in size, complexity and cost. Resumes of project superintendent and project manager shall be submitted. The Owner reserves the right of approval of the project superintendent.

Equivalent experience and qualifications will be considered where the bidder can demonstrate special management and construction abilities, expert workmen and past experience in constructing similar complex structures of similar size and cost such as hospitals, college buildings, multi-story office buildings, court houses, jails, hotels, etc. No consideration will be given to wood frame, residential projects, parking structures, small one story strip shopping centers, warehouses and industrial buildings, etc. Under this provision of equivalency, no consideration or award will be given to any contractor whose comparable project value is less than 50% of the value of the project under bid.

Each General Contractor bidding on this project will be required to demonstrate that his major Subcontractors are capable of pre-qualifying under the same conditions stated above.

All personnel required on the job site must at all times be in possession of **state issued** photo identification subject to examination by Owner or their representative. Other security requirements may also be in place and is the responsibility of the General Contractor to abide by all school rules.

The Owner and its representatives shall be the sole judge of the Contractor meeting the requirements set forth. The Owner's decision in determining qualified General Contractors will be final. The Owner reserves the right to act in its best interests in this determination process to waive all technicalities and informalities and to select the best qualified responsible General Contractors who comply with the above stated provisions.

All of the above information shall be required upon the Owner's request and may be considered a condition for award of contract.

ADVERTISEMENT FOR BIDS

Sealed proposals, in duplicate, from Qualified General Contractors will be received by the Awarding Authority: Talladega City Board of Education, 501 South Street East, Talladega, AL 35160, until 2:00 p.m. local time, Tuesday, August 16, 2022, for:

ADDITION AND RENOVATIONS TO CAFETERIA AT SALTER ELEMENTARY SCHOOL ARCHITECT JOB NO. 22-10

At such time and place, the bids will be opened and read. Bids that are received via mail and not presented at the bid opening are to be considered non-responsive. It is the responsibility of the bidder to assure that bids are presented at the time of the bid if they choose to mail the bid. Contractors must notify the Awarding Authority if a bid is to be received by mail.

A cashier's check or bid bond payable to Talladega City Board of Education in an amount not less than five (5) percent of the amount of the proposal, but in no event more than \$10,000.00, must accompany the bidder's proposal for each project. Performance and Payment Bonds and evidence of insurance as required in the bid documents will be required at the signing of the Contract.

Drawings and specifications for the project may be examined at the Office of Lathan Associates Architects, P.C., 300 Chase Park South, Suite 200, Hoover, AL 35244, and at the Digital Plan Room at Alabama Graphics (algraphicsplanroom.com). Private Jobs with Password. Password is lathan.

Prior to issuance of plans and specifications, all Contractors must provide evidence that they are properly licensed for the classification of work for this project. Evidence shall be in the form of a copy of current license clearly indicating all classifications, or sub-classifications, bid limits, license number, and expiration date.

General Contractor Bidders may obtain digital copies of drawings and specifications from the Architect for each project upon receipt of Application for Bid. General Contractors will then be placed on Official Bidders List. Hard copy sets of drawings/ specifications will be available to General Contractors for purchase directly from the document printer: Alabama Graphics. Addenda and other proposal information will be issued only to holders of drawings and specifications distributed by the Architect and on the Official Bidders List. Release of contract documents to the bidder does not imply acceptance of the bidder's qualifications by the Owner or Architect.

Bids received from General Contractors who are not on the Official Bidders List may not be accepted or opened. Lathan Associates Architects, P.C. makes no guarantee for plans and specifications obtained by Contractors and Vendors from sources other than the printed contract documents provided by their firm. Contractors and Vendors who base their pricing from contract documents obtained from other electronic sources, either in part or whole, do so at their own risk.

Bids must be submitted on proposal forms furnished by the Architect or copies thereof, issued either with the original contract documents or by addendum. General Contractors shall not use Proposal Forms other than those provided in the contract documents.

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. The Bidder must display current General Contractor's License Number on the outside of the sealed envelope in which the proposal is delivered, or it will not be considered by the Architect or Owner. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owner's judgment, the best interests of the Owner will thereby be promoted.

Talladega City Board of Education
Awarding Authority

Lathan Associates Architects, P.C.
205-988-9112

PRE-BID PROCEDURES

1. OBTAINING PLANS AND SPECIFICATIONS

A. General Contractors

General Contractors must contact the office of the Architect and give the following information about their company:

1. Name, address, phone, email address, Alabama General Contractor's License Number, Bid Limit, and Bid Classification as it appears on current license. This is required in order for Architect to verify that Contractor is currently licensed in a classification that qualifies the General Contractor to bid on the subject project.
2. A maximum of two (2) sets of plans and specifications will be issued to the General Contractor after qualifications have been confirmed and deposit has been received.
3. General Contractors must obtain the contract documents directly from the Architect and be placed on the Architect's official Bidders List. General Contractors may NOT obtain plans, specifications, proposal forms, and other contract documents exclusively from an Internet source, or any source other than the Architect. **If the General Contractor is not on the official Bidders List, their proposal may not be received and recognized at the bid opening.**
4. The following Plan Rooms are used:
 - a. Alabama Graphics Digital Plan Room is also used. See attachment for contact information. **Project Password is Lathan.**
 - b. Refer to Advertisement for Bids for list of Plan Rooms and addresses of Awarding Authority and Architect.
5. Addenda are only sent to the Plan Rooms, the Awarding Authority and the General Contractors who are on the Official Bidders List. Addenda are not sent to Subcontractors and/or Vendors.
6. Electronic files and/or CAD files are not considered to be Contract Documents.
 - a. Errors may occur during translation and Lathan Associates Architects, P.C. makes no representation or warranty as to any information contained therein. It will be the responsibility of the General Contractor, Subcontractor and/or Vendor to verify all layouts, dimensions and other information for accuracy with the Contract Documents and subsequent Addenda.
 - b. Electronic files and/or CAD files will not be sent by the Architect, Engineers or Consultants to Contractors for bid purposes.

B. Subcontractors and Vendors

1. Subcontractors and Vendors may obtain plans and/or specifications from the following sources:
 - a. Plan Rooms listed in Item 4 above.
 - b. General Contractors
 - c. View set at office of Architect or Awarding Authority.

2. Architect's office will not release plans and specifications to Subcontractors and Vendors.
3. Architect's office will email a copy of Bidders List to Subcontractors and Vendors upon request. Bidders List is also available on Alabama Graphics Digital Plan Room.

2. DEPOSIT ON PLANS AND SPECIFICATIONS

- A. Deposit will be returned to General Contractors under the following conditions:
 1. Plans and specifications must be returned to the office of the Architect within thirty days of bid date.
 2. Plans and specifications must be bound in the same manner as originally received from the Architect.
 3. Plans and specifications must be in good, reusable condition. Missing pages/sheets, excessive markings, use of highlighters, and other detrimental conditions may cause forfeiture of deposit. Rule of thumb: If the Architect cannot present the set to the successful Contractor for use in construction, then the set will be destroyed, and cost of re-printing is used from the proceeds of the forfeited deposit.
 4. General Contractors who obtain plans and specifications and wish to withdraw from the Bidders List must do one of the following prior to bid date:
 - a. Return plans and specifications to the office of the Architect, or
 - b. Submit a letter to the office of the Architect stating request to be withdrawn, otherwise, deposit will be forfeited.

3. REQUEST FOR INFORMATION (RFI's)

- A. All RFI's must be numbered and made in writing to the Architect's email rfi@lathanassociates.com. Please include your name, company name, telephone number, and fax number so that we may respond appropriately. Verbal RFI's will not be answered. All RFI's must be in writing.
- B. The Team List provided within the Specification Manual is for informational purposes only and should not be used to contact Engineers and/or Consultants directly with questions regarding the project.
- C. All questions that need to be directed to an Engineer / Consultant must be routed through the Architect's office. If applicable, the Architect will contact the appropriate Engineer / Consultant for information.
- D. Bids shall be based upon the official Contract Documents consisting of Plans, Specifications and Addenda. Architect assumes no responsibility for information used by Contractors outside the official Contract Documents.
- E. We will not respond to any correspondence received via any e-mail other than the one listed.

4. REQUESTS FOR PRODUCT APPROVAL

- A. All Requests for Product Approval must be made in writing to the office of the Architect. Requests must be accompanied by Product Substitution Form completed and signed found in Specification Section - 01360 and may be delivered/ mailed/ or emailed to Lathan Associates Architects, P.C., 300 Chase Park South, Suite 200, Hoover, AL 35244. rfl@lathanassociates.com. Please include your name, company name, telephone number, fax number or email address so that we may respond appropriately.
- B. Vendor/Contractor submitting Request for Product Approval must submit data sheets and other such fact-based documentation for substitution with items clearly marked to show compliance with product originally specified. Request must identify model number of substitution that complies with product originally specified. Architect and Interior Design staff will not review Requests for Product Approval that are catalogs and/or binders of manufactured products without separate details showing comparison between specified product and requested substitution.
- C. Products approved by Architect, Interior Designer, Engineer and/or Consultant shall be contingent upon meeting or exceeding the specification and drawing requirements.
- D. The Team List provided within the Specification Manual is for informational purposes only and should not be used to contact Engineers and/or Consultants directly with requests for product approval.
- E. All requests that need to be directed to an Engineer /Consultant must be routed through the Architect's office. If applicable, the Architect will contact the appropriate Engineer / Consultant for approval of product.

PRE-BID REQUEST FOR INFORMATION FORM

Date: _____

Company Submitting Request: _____

Contact Name: _____ Phone: _____

E-Mail _____

Project Name: _____

Architect Job No. _____

Send to rfi@lathanassociates.com

RFI NO. _____

RESPONSE:

For Architect's Use:

Reviewed By / Date: _____

Responded By/ Date: _____

Processed by Addendum No. _____

Comments: _____

Digital Plan Room Sign-On Instructions

To access the Digital Plan Room, please click on the following link. You will want to add this as a trusted site for future emails.

<https://www.algraphicsplanroom.com>

You will need to register to the plan room as a user. Click "**Log In**" on lower left side. You will need to do a search to see if your company already exists on the plans room. Once you register your company and contact information click on "**Private Jobs with Passwords**" and enter the password provided.

Password for this project is lathan.

For technical assistance please call, Customer Service 205.252.8505 or customerservice@algraphics.com.

INSTRUCTIONS TO BIDDERS

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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 shall not be less than five percent of the contractor's bid, but is not required to be in an amount more than ten thousand dollars.

d. Delivery of Bids:

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

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

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

9. WITHDRAWAL or REVISION of BIDS:

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

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

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

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

10. OPENING of BIDS:

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

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

11. INCOMPLETE and IRREGULAR BIDS:

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

12. BID ERRORS:

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

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

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

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

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

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

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

13. DISQUALIFICATION of BIDDERS:

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

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

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

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

14. CONSIDERATION of BIDS:

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

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

15. DETERMINATION of LOW BIDDER by USE of ALTERNATES:

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

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

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

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

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

16. UNIT PRICES:

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

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

17. AWARD of CONTRACT:

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

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

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

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

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

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

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

END of INSTRUCTIONS TO BIDDERS



Kay Ivey
Governor

Bill Poole
Director of Finance

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

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

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.

PROPOSAL FORM

To: Talladega City Board of Education Date: _____

In compliance with your 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: Addition and Renovations to Cafeteria at Salter Elementary School, Architect's Job No. 22-10 in

accordance with Drawings and Specifications, dated, July 8, 2022, prepared by Lathan Associates

Architects, P.C., 300 Chase Park South, Suite 200, Hoover, AL 35244, Architect. 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.

ALLOWANCES: The Bidder acknowledges by initials _____ that he/she has read Specification Section 01020 - Allowances and has included cost of same in bid.

ALABAMA IMMIGRATION LAW COMPLIANCE: The Bidder acknowledges by initials _____ that he/she will comply with H.B. 56 - Alabama Immigration Law Compliance.

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:

Alternate No. 1 (Allowance No. 1) (add) \$ _____

Alternate No. 2 (Rolling Door) (add) \$ _____

UNIT PRICES: See Attachment

Job No. 22-10

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 comply.

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

____ Bid Bond, executed by _____ as Surety,
____ 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)** _____ (Seal)

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

Telephone Number _____

Email Address _____

- * If other than an 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.

PROPOSAL FORM ATTACHMENT

UNIT PRICES

For certain items of **credit or extra work**, if required, the undersigned proposes UNIT PRICES as follows:

<u>EARTH EXCAVATION</u>	General	\$ _____/per cu.yd.
	In Trenches	\$ _____/per cu. yd.
<u>EARTH FILL</u>	General	\$ _____/per cu. yd.
<u>UNDERCUTTING & REPLACEMENT OF UNSUITABLE SOILS</u>		\$ _____/per cu. yd.

Note: All grading shown on the drawings shall be included in the Base Bid as Unclassified to required subgrade elevations. This Base Bid grading shall include the required cutting and filling of the existing grade to the proposed subgrade elevation. Onsite Geotechnical engineer shall determine if unsuitable soils are present.

Refer to SECTION 02300 - EARTHWORK for additional information regarding undercut & replacement of unsuitable soils and associated quantity allowance.

Note: Costs for profit and overhead shall be included in Unit Prices.

Note: Unit Prices are provided for the addition to or deletion from the contract Base Bid.

BIDDER (to be signed by an Officer of the Company)

_____	by _____
(Name/Title)	(Legal Signature)

WITNESS (to the above signature)

_____	by _____
(Name/Title)	(Legal Signature)

Do not staple this form; use clips.

DCM Form C-4
August 2021

BID BOND

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

Name:

Address:

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

Name:

Address:

The **OWNER** (*Entity name and address*)

Name:

Address:

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

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

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

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

- (a) executes and delivers a Construction Contract with the required Performance and Payment Bonds (each in the form contained in the Bid Documents and properly completed in accordance with the bid) and delivers evidence of insurance as prescribed in the Bid Documents, or
- (b) fails to execute and deliver such Construction Contract with such Bonds and evidence of insurance, but pays the Owner the difference, not to exceed the Penal Sum of this Bond, between the amount of the Principal's Bid and the larger amount for which the Owner may award a Construction Contract for the same Work to another bidder, then, this obligation shall be null and void, otherwise it shall remain in full force and effect.

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

SIGNED AND SEALED this _____ day of _____, _____.

ATTEST:

PRINCIPAL:

By _____

Name and Title

SURETY:

ATTEST:

By _____

Name and Title

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

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

(1) DCM (BC) Project # _____ (required)

PSCA Project # _____ (required)

DCM Form 9-A, December 2021;
PSCA version of DCM Form C-5

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

CONSTRUCTION CONTRACT

- (2) This Construction Contract is entered into this _____ day of _____ in the year of _____
between the **OWNERS**, the **ALABAMA PUBLIC SCHOOL AND COLLEGE AUTHORITY**
(3) and **LOCAL OWNER**,

Entity Name:

Address:

Email & Phone #:

- (4) and the **CONTRACTOR**,

Company Name:

Address:

Email & Phone #:

- (5) State of AL Accounting & Resource System (STAARS) or AL Buys Vendor No.: _____
for the **WORK** of the Project, identified as:

- (6) The **CONTRACT DOCUMENTS** are dated _____

and have been amended by

- (7) **ADDENDA**

- (8) The **ARCHITECT** is

Firm Name:

Address:

Email & Phone #:

- (9) The **CONTRACT SUM** is

Dollars (\$) _____ and is the sum of the Contractor's Base Bid for the Work and the following

- (10) **BID ALTERNATE PRICES:**

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

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

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

(13) **SPECIAL PROVISIONS** *(such as acceptance or rejection of unit prices. Indicate continuation on an attachment if needed;*

A. SEVERABLE PAYMENTS: The Alabama Public School and College Authority will first pay the Contractor _____ Dollars (\$ _____) from its available funds and the _____ will thereafter pay the Contractor the remaining _____ Dollars (\$ _____) from its available funds.

B.

(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:

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

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.

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

(15)

APPROVALS

**ALABAMA DEPARTMENT OF FINANCE,
REAL PROPERTY MANAGEMENT,
DIVISION OF CONSTRUCTION MANAGEMENT
(DCM)**

By _____
Director

REVIEWED BY AND FUNDS AVAILABLE:

PSCA funds are available in the amount stated in
(13) "Special Provisions", Paragraph A.

By _____
Contract Administrator

CONTRACTING PARTIES

Contractor Company

By _____
Signature

Name & Title _____

Local Owner Entity

By _____
Signature

Name & Title _____

**ALABAMA PUBLIC SCHOOL and COLLEGE
AUTHORITY**

By _____ Date: _____
Governor and President of Authority

Review/Signature flow: Architect/Engineer (prepare documents) > Contractor (review and sign) > Architect/Engineer (review) > Local Owner (review and sign) > DCM (review and sign) > Finance-Legal > Governor (review and sign) > DCM (distribute the fully executed Contract to all parties along with a Notice to Proceed).

SURETY'S BOND NUMBER

(1) **PERFORMANCE BOND**

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: The ALABAMA PUBLIC SCHOOL AND COLLEGE AUTHORITY** and
(*Local Owner entity's name and address, same as appears in the Construction Contract*)

Name:

Address:

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

Dollars (\$)).

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

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

1. **WE, THE PRINCIPAL** (hereinafter "**Contractor**") **AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above for the performance of the Contract, and Contract Change Orders, in accord with the requirements of the Contract Documents, which are incorporated herein by reference. If the Contractor performs the Contract, and Contract Change Orders, in accordance with the Contract Documents, then this obligation shall be null and void; otherwise it shall remain in full force and effect.
2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

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

3. Whenever the Architect gives the Contractor and the Surety, at their addresses stated above, a written Notice to Cure a condition for which the Contract may be terminated in accordance with the Contract Documents, the Surety may, within the time stated in the notice, cure or provide the Architect with written verification that satisfactory positive action is in process to cure the condition.
4. The Surety's obligation under this Bond becomes effective after the Contractor fails to satisfy a Notice to Cure and the Owner:
 - (a) gives the Contractor and the Surety, at their addresses stated above, a written Notice of Termination declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the notice; and
 - (b) gives the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation under this Bond.
5. In the presence of the conditions described in Paragraph 4, the Surety shall, at its expense:
 - (a) On the effective date of the Notice of Termination, take charge of the Work and be responsible for the safety, security, and protection of the Work, including materials and equipment stored on and off the Project site, and
 - (b) Within twenty-one days after the effective date of the Notice of Termination, proceed, or provide the Owner with written verification that satisfactory positive action is in process to facilitate proceeding promptly, to complete the Work in accordance with the Contract Documents, either with the Surety's resources or through a contract between the Surety and a qualified contractor to whom the Owner has no reasonable objection.
6. As conditions precedent to taking charge of and completing the Work pursuant to Paragraph 5, the Surety shall neither require, nor be entitled to, any agreements or conditions other than those of this Bond and the Contract Documents. In taking charge of and completing the Work, the Surety shall assume all rights and obligations of the Contractor under the Contract Documents; however, the Surety shall also have the right to assert "Surety Claims" to the Owner in accordance with the Contract Documents. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to promptly take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.
7. By accepting this Bond as a condition of executing the Construction Contract, and by taking the actions described in Paragraph 4, the Owner agrees that:
 - (a) the Owner shall promptly advise the Surety of the unpaid balance of the Contract Sum and, upon request, shall make available or furnish to the Surety, at the cost of reproduction, any portions of the Project Record, and
 - (b) as the Surety completes the Work, or has it completed by a qualified contractor, the Owner shall pay the Surety, in accordance with terms of payment of the Contract Documents, the unpaid balance of the Contract Sum, less any amounts that may be or become due the Owner from the Contractor under the Construction Contract or from the Contractor or the Surety under this Bond.
8. In the presence of the conditions described in Paragraph 4, the Surety's obligation includes responsibility for the correction of Defective Work, liquidated damages, and reimbursement of any reasonable expenses incurred by the Owner as a result of the Contractor's default under the Contract, including architectural, engineering, administrative, and legal services.

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

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

- (a) the cost of completing the Contractor's responsibilities under the Contract, including correction of Defective Work;
- (b) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to completing the Work;
- (c) interest on, and the cost of obtaining, funds to supplement the unpaid balance of the Contract Sum as may be necessary to cover the foregoing costs;
- (d) the fair market value of any reductions in the scope of the Work necessitated by insufficiency of the unpaid balance of the Contract Sum and available supplemental funds to cover the foregoing costs; and
- (f) additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees incident to ascertaining and collecting the Owner's losses under the Bond.

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

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

(9 & 10) **SURETY:**

CONTRACTOR as PRINCIPAL:

Surety Company Name

Contractor Company Name

By _____

By _____

Signee's Printed Name and Title

Signee's Printed 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 as appears in the Construction Contract)*

Name:

Address:

- (3) **The SURETY** *(Company name and primary place of business)*

Name:

Address:

- (4) **The OWNER: The ALABAMA PUBLIC SCHOOL AND COLLEGE AUTHORITY** and
(Local Owner entity's 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:

Surety Company Name

Contractor Company Name

By _____

By _____

Signee's Printed Name and Title

Signee's Printed 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.



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.

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

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)

Project:		DCM (BC) Project Number:				DCM Form C-10SOV Revised October 2021			
Contractor Company:		PSCA Project Number, if any:							
		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 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:
2.					\$ -	\$ -	\$ -		
3.					\$ -	\$ -	\$ -		
4.					\$ -	\$ -	\$ -		
5.					\$ -	\$ -	\$ -		
6.					\$ -	\$ -	\$ -		
7.					\$ -	\$ -	\$ -		
8.					\$ -	\$ -	\$ -		
9.					\$ -	\$ -	\$ -		
10.					\$ -	\$ -	\$ -		
11.					\$ -	\$ -	\$ -		
12.					\$ -	\$ -	\$ -		
13.					\$ -	\$ -	\$ -		
14.					\$ -	\$ -	\$ -		
15.					\$ -	\$ -	\$ -		
16.					\$ -	\$ -	\$ -		
17.					\$ -	\$ -	\$ -		
18.					\$ -	\$ -	\$ -		
19.					\$ -	\$ -	\$ -		
20.					\$ -	\$ -	\$ -		
21.					\$ -	\$ -	\$ -		
22.					\$ -	\$ -	\$ -		
23.					\$ -	\$ -	\$ -		
24.					\$ -	\$ -	\$ -		
25.					\$ -	\$ -	\$ -		
		\$ -	\$ -	\$ -	1.	2.	3.	3.	4.
TOTALS:		\$	\$	\$	1.	2.	3.	3.	4.
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	B	C	D	E
Description	Materials Stored Last Period	Materials Purchased This Period (period noted above)	Materials Used This Period (period noted above)	Materials Presently Stored (B + C - D)
TOTALS:				
Instructions: • This Form C-10SM must be submitted as part of the payment application documentation when a Materials Presently Stored amount of anything greater than \$0 is noted on line 2 of DCM Form C-10: Application and Certificate for Payment. • Receipts must be provided as attachments to this form C-10SM for all amounts placed in Column C: Materials Purchased This Period. • The total \$ amount of this Form C-10SM's column E: Materials Presently Stored must match both Form C-10's line 2: Materials Presently Stored, and Form C-10SOV: Schedule of Values' total \$ amount of Column G: Materials Presently Stored. • The \$ amounts in this current Form C-10SM's Column D: Materials Used This Period are amounts that must all be included in the current payment application's Form C-10SOV's Column E: Work Completed This Period. • The \$ amounts in this current Form C-10SM's Column E: Materials Presently Stored are the amounts that must be listed in the next payment application's Form C-10SM's Column B: Materials Stored Last Period.				

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

DCM Form 9-J, August 2021;
PSCA version of DCM Form C-12;
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) # _____ (required)
PSCA # _____ (required)

TO: Contractor Company Name & Address:	PROJECT:

TERMS: You are hereby authorized, subject to the provisions of your Contract for this project, to make the following changes thereto in accordance with your proposal(s) dated _____

FURNISH the necessary labor, materials, and equipment to *(Description of work to be done or changes to be made. If the description is continued in an attachment, identify the attachment below.):*

Description continued from Page 1:

ORIGINAL CONTRACT SUM \$ _____
NET TOTAL OF PREVIOUS CHANGE ORDERS \$ _____
PREVIOUS REVISED CONTRACT SUM \$ _____
THIS CHANGE ORDER WILL ☐ INCREASE ☐ DECREASE
THE CONTRACT SUM BY \$ _____
REVISED CONTRACT SUM, INCLUDING THIS CHANGE ORDER \$ _____

EXTENSION OF TIME resulting from this Change Order: ☐ None or _____ Calendar days

The amount of this Change Order will be the responsibility of _____

(Owner and/or PSCA)

The Owner does hereby certify that this Change Order was executed per the provisions of Title 39, Code of Alabama, 1975, as amended.

CONTRACTING PARTIES

Architectural/Engineering Firm
Recommended By _____
Name & Title _____

Contractor Company
By _____
Name & Title _____

Local Owner Entity
By _____
Name & Title _____

ALABAMA PUBLIC SCHOOL & COLLEGE AUTHORITY	
By _____	Date: _____
Governor and President of Authority	

CONSENT OF SURETY	
Surety Company	
By _____	(Attach current Power of Attorney)
Name & Title _____	

APPROVALS

**ALABAMA DEPARTMENT OF FINANCE,
REAL PROPERTY MANAGEMENT
DIVISION OF CONSTRUCTION MANAGEMENT (DCM)**

By _____
Director

Reviewed By _____
Contract Administrator

For DCM office use only:

- _____ PSCA funds are available to fund this change order.
_____ PSCA funds will not be used to fund this change order.

Review/Signature flow: Architect/Engineer (prepare documents) > Contractor (review and sign) (> Surety for additive \$ change orders only [sign]) > Architect/Engineer (review and sign) > Local Owner (review and sign) > DCM (review and sign) > Finance-Legal > Governor (review and sign) > DCM (distribute fully executed Change Order to all parties).

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)	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">ORIGINAL CONTRACT AMOUNT</td> <td style="width: 33%;">PREVIOUS C.O.'s _____ THRU _____</td> <td style="width: 33%;">CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER</td> </tr> <tr> <td>\$ _____</td> <td>+ \$ _____</td> <td>= \$ _____</td> </tr> </table>		ORIGINAL CONTRACT AMOUNT	PREVIOUS C.O.'s _____ THRU _____	CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER	\$ _____	+ \$ _____	= \$ _____
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						

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

GENERAL CONTRACTOR'S ROOFING GUARANTEE

DCM (BC) Project No. _____

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

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

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturers recommendations.
2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.
3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

- A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.
- B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.
- C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.
- D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
- E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

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

General Contractor's Authorized Signature

Typed Name and Title

GENERAL CONTRACTOR'S FIVE YEAR BUILDING ENVELOPE GUARANTEE

Project Name and Address: 	Owner's Name and Address:
Architect's Name and Address: LATHAN ASSOCIATES ARCHITECTS, P.C. 300 Chase Park South, Suite 200 Hoover, AL 35244 Architect's Job No.: _____	General Contractor's Name, Address, and Phone No.:
EFFECTIVE DATES OF GUARANTEE: Start: _____ Period: Five (5) Years <div style="text-align: center; font-size: small;">Date of Substantial Completion</div>	

General Contractor warrants to the Owner (named above) for a period of Five Years the entire Building Envelope will be weathertight, moisture and wind impermeable and uncompromised as a result of materials and/or workmanship provided. Should any portion of the Building Envelope develop moisture and/or wind infiltration during the warranty period, the General Contractor shall promptly address, employ clean-up and temporary measures to prevent further resultant damage and provide corrections to the Building Envelope and/or consequently damaged work of such quality consistent with the original scope of work as deemed by the Architect. Corrective work shall be subject to special scheduling as required to prevent disruption of the Owner's ongoing operations and shall be subject to the same General Conditions and work ethics as required for the original work.

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 and any damage caused by such addition. If this contract is for an addition to an existing building, then this guarantee covers the work involved at the point of connection.

Upon discovery, the Owner shall promptly notify the General Contractor of observed or suspected compromises and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such.

The General Contractor shall be afforded reasonable and scheduled opportunity to make periodic preventative observations of the work associated with this warranty.

This Building Envelope Warranty shall be effective concurrently with the required DCM Form C-9 General Contractor's Roofing Guarantee and both shall be submitted fully executed as independent documents to the Architect at the time of the Final Inspection.

This instrument has been duly executed this _____ day of _____, 20__.

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 FAX (334) 242-4182

CERTIFICATE OF SUBSTANTIAL COMPLETION

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

ROUTING PROCEDURES ON NEXT PAGE

DCM (BC) No. _____

OWNER ENTITY NAME AND ADDRESS: 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 (signature and email address required):	
ARCHITECT/ENGINEER: _____	DATE: _____
CONTRACTING PARTIES:	
CONTRACTOR: _____	DATE: _____
OWNER: _____	DATE: _____
APPROVALS:	DATE: _____
DCM INSPECTOR: _____	DATE: _____
DCM CHIEF INSPECTOR: _____	DATE: _____
DCM DIRECTOR: _____	DATE: _____

SAMPLE FORM OF ADVERTISEMENT FOR COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given

that _____
(Contractor Company Name)

Contractor, has completed the Contract for ☐ (Construction) ☐ (Renovation) ☐ (Alteration)
☐ (Equipment) ☐ (Improvement) of _____
(Name of Project):

at _____

(Insert location data in County or City)

for the State of Alabama and the (County) (City) of _____,
Owner(s), and have made request for final settlement of said Contract. All persons having
any claim for labor, materials, or otherwise in connection with this project should immediately
notify

(Architect / Engineer)

(Contractor)

(Business Address)

NOTE: This notice must be run once a week for four successive weeks for projects exceeding \$50,000.00. For projects of \$50,000.00 or less, run one time only. A copy of the publisher's affidavit of publication (including a copy of the advertisement) shall be submitted by the Contractor to the Design Professional for inclusion with DCM Form B-13: Final Payment Checklist for state agencies, PSCA-funded and other bond-funded projects.

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Payment of Debts and Claims

To Owner (<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:

Company Name

Seal:

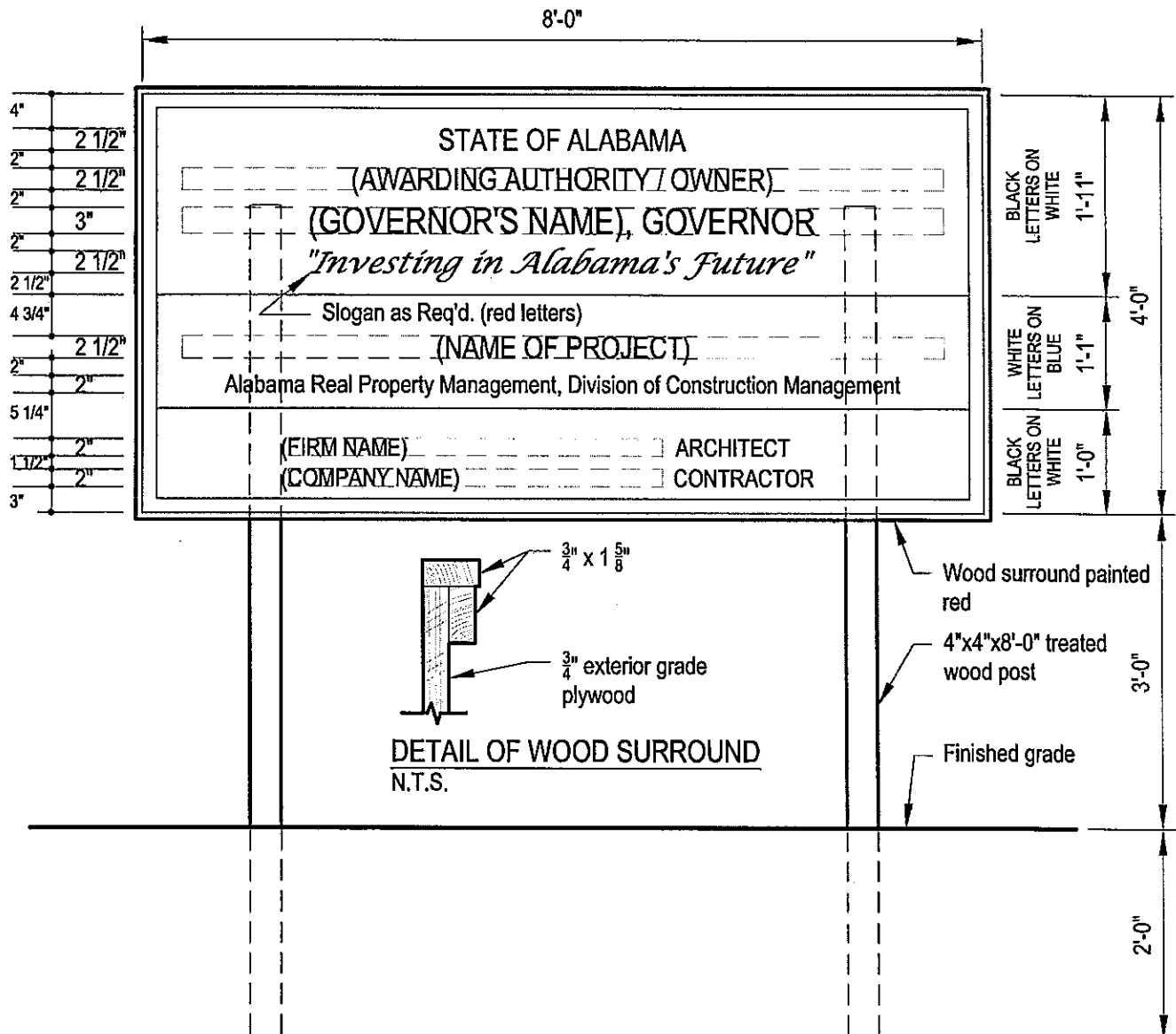
By _____
Signature of Authorized Representative

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.

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.

Detail of PSCA Plaque

The diagram shows a rectangular plaque with a double-line border. The overall height is 2'-0" and the overall width is 1'-0". The text is centered within the plaque. The text layout is as follows:

PROJECT NAME
OR TITLE
CITY NAME. ALABAMA
ERECTED 20__
STATE OF ALABAMA
PUBLIC SCHOOL AND COLLEGE AUTHORITY
GOVERNOR [] [] [] [] [] [] [] [] [] [] PRESIDENT
[] [] [] [] [] [] [] [] [] [] VICE PRESIDENT
[] [] [] [] [] [] [] [] [] [] SECRETARY
SUPERVISED BY
Alabama Real Property Management, Division of Construction Management
[] [] [] [] [] [] [] [] [] [] ARCHITECT
[] [] [] [] [] [] [] [] [] [] CONTRACTOR

Dimensions on the left side (from top to bottom): 1", 1", 1 5/8", 5/8", 1 5/8", 3/4", 7/8", 7/8", 1 1/8", 7/8", 1 1/2", 1/2", 1", 3/8", 7/8", 3/8", 3/4", 3/8", 3/4", 1/2", 5/8", 3/8", 1", 3/4", 1/2", 3/4", 1".

Dimension on the right side: 2'-0".

Notes:

1. PSCA plaques are installed as a permanent part of a building and are required on the following partially or fully PSCA-funded projects: Major renovations, renovations of four (4) or more rooms, and all new construction as follows: buildings, additions, and athletic facilities. DCM Form 9-M must be included in the project manual of such projects. Exception: Alabama Community College System (ACCS) PSCA-funded projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.
2. PSCA plaques are not required on the following partially or fully PSCA-funded projects: Sitework, paving, parking lots, utility work, re-roofing, and finishes (such as painting). DCM Form 9-M should not be included in the project manual of such projects.
3. The erection year is the year the project is completed.
4. Guidance for determining the names of PSCA officials:
The PSCA President is the current Governor of Alabama.
The PSCA Vice President is the current State Superintendent of Education.
The PSCA Secretary is the current Director of the Alabama Department of Finance.

GENERAL CONDITIONS of the CONTRACT

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| | 51. <u>Sign</u> |

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 \$50,000):**

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

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

written Notice of Termination.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B. TERMINATION by the OWNER for CONVENIENCE

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

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

- (a)** stop Work as specified in the notice;
- (b)** enter into no further subcontracts or purchase orders for materials, services, or facilities, except as may be necessary for Work directed to be performed prior to the effective date of the termination or to complete Work that is not terminated;
- (c)** terminate all existing subcontracts and purchase orders to the extent they relate to the terminated Work;
- (d)** take such actions as are necessary, or directed by the Architect or Owner, to protect, preserve, and make safe the terminated Work; and
- (e)** complete performance of the Work that is not terminated.

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

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

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

A. SUSPENSION by the OWNER

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

B. NONPAYMENT

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

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

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

ARTICLE 29
PROGRESS PAYMENTS

A. FREQUENCY of PROGRESS PAYMENTS

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

B. SCHEDULE of VALUES

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

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

C. APPLICATIONS for PAYMENTS

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

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

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

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

D. MATERIALS STORED OFF SITE

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

- (1) the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location;
- (2) a Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party;
- (3) the Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate

- inspection and verification of the presence of the materials or equipment by the Architect or Owner;
- (4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner; and
 - (5) compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

E. RETAINAGE

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

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

F. CONTRACTOR'S CERTIFICATION

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

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

G. PAYMENT ESTABLISHES OWNERSHIP

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

ARTICLE 30
CERTIFICATION and APPROVALS for PAYMENT

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

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

- B.** Within seven days after receiving the Contractor's monthly Application for Payment, or such other time as may be stated in the Contract Documents, the Architect will take one of the following actions:
- (1) The Architect will approve and certify the Application as submitted and forward it to the Owner as a Certification for Payment for approval by the Owner (and other approving authorities, if any) and payment.
 - (2) If the Architect takes exception to any amounts claimed by the Contractor and the Contractor and Architect cannot agree on revised amounts, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to certify to the Owner, transmitting a copy of same to the Contractor.
 - (3) To the extent the Architect determines may be necessary to protect the Owner from loss on account of any of the causes stated in Article 31, the Architect may subtract from the Contractor's estimates and will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due and notify the Contractor and Owner in writing of the Architect's reasons for withholding payment in whole or in part.
- C.** Neither the Architect's issuance of a Certificate for Payment nor the Owner's resulting progress payment shall be a representation to the Contractor that the Work in progress or completed at that time is accepted or deemed to be in conformance with the Contract Documents.
- D.** The Architect shall not be required to determine that the Contractor has promptly or fully paid Subcontractors and suppliers or how or for what purpose the Contractor has used monies paid under the Construction Contract. However, the Architect may, upon request and if practical, inform any Subcontractor or supplier of the amount, or percentage of completion, approved or paid to the Contractor on account of the materials supplied or the Work performed by the Subcontractor.

ARTICLE 31 **PAYMENTS WITHHELD**

- A.** The Architect may nullify or revise a previously issued Certificate for Payment prior to Owner's payment thereunder to the extent as may be necessary in the Architect's opinion to protect the Owner from loss on account of any of the following causes not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:
- (1) Defective Work;
 - (2) filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;
 - (3) the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;
 - (4) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

- (5) damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;
 - (6) reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or
 - (7) the Contractor's persistent failure to conform to the requirements of the Contract Documents.
- B. If the Owner deems it necessary to withhold payment pursuant to preceding Paragraph A, the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.
- C. The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.
- (1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.
 - (2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.
- D. The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.
- E. The Owner shall have the right to withhold from payments due the Contractor under this Contract an amount equal to any amount which the Contractor owes the Owner under another contract.

ARTICLE 32

SUBSTANTIAL COMPLETION

- A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items). Substantial Completion of the Work, or a designated portion of the Work, is not achieved until so agreed in a Certificate of Substantial Completion signed by the Contractor, Architect, Owner, and Technical Staff of the Alabama Division of Construction Management.
- B. The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items

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

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

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

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

D. RELEASE of CLAIMS

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

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

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

be filed.

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

E. EFFECT of FINAL PAYMENT

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

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

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

**ARTICLE 35
CONTRACTOR'S WARRANTY**

A. GENERAL WARRANTY

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

B. ONE-YEAR WARRANTY

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

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

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

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

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

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

C. GENERAL CONTRACTOR'S ROOFING GUARANTEE

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

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

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

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

D. SPECIAL WARRANTIES

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

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

E. ASSUMPTION of GUARANTEES of OTHERS

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

**ARTICLE 36
INDEMNIFICATION AGREEMENT**

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants (hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of, related to, or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including loss of use resulting therefrom, and is caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part, or is alleged but not legally established to have been caused in whole or in part by the negligence or other fault of a party indemnified hereunder.

- A. This indemnification shall extend to all claims, damages, losses and expenses for injury or damage to adjacent or neighboring property, or persons injured thereon, that arise out of, relate to, or result from performance of the Work.
- B. This indemnification does not extend to the liability of the Architect, or the Architect's Consultants, agents, or employees, arising out of (1) the preparation or approval of maps, shop drawings, opinions, reports, surveys, field orders, Change Orders, drawings or specifications, or (2) the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions is the primary cause of the injury or damage.
- C. This indemnification does not apply to the extent of the sole negligence of the Indemnitees.

ARTICLE 37
CONTRACTOR'S and SUBCONTRACTORS' INSURANCE

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

A. GENERAL

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

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

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

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

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

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

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

B. INSURANCE COVERAGES

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

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

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

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

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

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

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

<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 LIABILITY INSURANCE

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

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

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

.1 \$ 5,000,000 per Occurrence

.2 \$ 5,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella Liability Insurance:

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

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

(5) BUILDER'S RISK INSURANCE

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

(b) The policy shall be endorsed as follows:

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

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

(ii) Partial or complete occupancy by Owner; or

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

C. SUBCONTRACTORS' INSURANCE

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

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

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

D. TERMINATION of OBLIGATION to INSURE

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

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

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

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

E. WAIVERS of SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work.

ARTICLE 38
PERFORMANCE and PAYMENT BONDS

A. GENERAL

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

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

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

B. PERFORMANCE BOND

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

C. PAYMENT BOND

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

D. CHANGE ORDERS

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

E. EXPIRATION

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

ARTICLE 39
ASSIGNMENT

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

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

ARTICLE 40
CONSTRUCTION by OWNER or SEPARATE CONTRACTORS

A. OWNER'S RESERVATION of RIGHT

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

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

B. COORDINATION

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

C. CONDITIONS APPLICABLE to WORK PERFORMED by OWNER

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

D. MUTUAL RESPONSIBILITY

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

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

the Architect in writing of the condition discovered.

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

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

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

ARTICLE 41 **SUBCONTRACTS**

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

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

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

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

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

B. SUBCONTRACTUAL RELATIONS

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

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

ARTICLE 42

ARCHITECT'S STATUS

- A. The Architect is an independent contractor performing, with respect to this Contract, pursuant to an agreement executed between the Owner and the Architect. The Architect has prepared the Drawings and Specifications and assembled the Contract Document and is, therefore, charged with their interpretation and clarification as described in the Contract Documents. As a representative of the Owner, the Architect will endeavor to guard the Owner against variances from the requirements of the Contract Documents by the Contractor. On behalf of the Owner, the Architect will administer the Contract as described in the Contract Documents during construction and the Contractor's one-year warranty.
- B. So as to maintain continuity in administration of the Contract and performance of the Work, and to facilitate complete documentation of the project record, all communications between the Contractor and Owner regarding matters of or related to the Contract shall be directed through the Architect, unless direct communication is otherwise required to provide a legal notification. Unless otherwise authorized by the Architect, communications by and with the Architect's consultants shall be through the Architect. Unless otherwise authorized by the Contractor, communications by and with Subcontractors and material suppliers shall be through the Contractor.

C. ARCHITECT'S AUTHORITY

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

(1) The Architect is authorized to:

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

(2) The Architect is not authorized to:

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

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

D. LIMITATIONS of RESPONSIBILITIES

(1) The Architect shall not be responsible to Contractors or to others for supervising or coordinating the performance of the Work or for the Construction Methods or safety of the Work, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Architect will not be responsible to the Contractor (nor the Owner) for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents or for acts or omissions of the Contractor, a Subcontractor, or anyone for whose acts they may be liable. However, the Architect will report to the Owner and Contractor any Defective Work recognized by the Architect.

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

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

E. ARCHITECT'S DECISIONS

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

ARTICLE 43
CASH ALLOWANCES

- A. All allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner and the Contractor shall afford the Owner the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.
- B. Unless otherwise provided in the Contract Documents:
 - (1) allowances shall cover the cost to the Contractor of materials and equipment delivered to the

- Project site and all applicable taxes, less applicable trade discounts;
- (2) the Contractor's costs for unloading, storing, protecting, and handling at the site, labor, installation, overhead, profit and other expenses related to materials or equipment covered by an allowance shall be included in the Contract Sum but not in the allowances;
 - (3) if required, the Contract Sum shall be adjusted by Change Order to reflect the actual costs of an allowance.
- C. Any selections of materials or equipment required of the Architect or Owner under an allowance shall be made in sufficient time to avoid delay of the Work.

ARTICLE 44 **PERMITS, LAWS, and REGULATIONS**

A. PERMITS, FEES AND NOTICES

- (1) Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after award of the Construction Contract and which are in effect on the date of receipt of bids.
- (2) The Contractor shall comply with and give notices required by all laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

B. TAXES

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

C. COMPENSATION for INCREASES

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

D. ALABAMA IMMIGRATION LAW

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

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

all damages resulting therefrom.

E. ALABAMA BOYCOTT LAW

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

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

F. ACCOUNTING OF SALES TAX EXEMPT PROJECTS

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

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

ARTICLE 45
ROYALTIES, PATENTS, and COPYRIGHTS

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

ARTICLE 46
USE of the SITE

- A.** The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials, equipment, employees' vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.
- B.** Unless otherwise provided in the Contract Documents, temporary facilities, such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner.

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

ARTICLE 47
CUTTING and PATCHING

- A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to execute the Work to the results indicated in the Contract Documents or to make its parts fit together properly.
- B. Any cutting, patching, or excavation by the Contractor shall be supervised and performed in a manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of the Owner or separate contractors.

ARTICLE 48
IN-PROGRESS and FINAL CLEANUP

A. IN-PROGRESS CLEAN-UP

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

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

B. FINAL CLEAN-UP

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

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

- (a) **Cleaning of all painted, enameled, stained, or baked enamel work:** Removal of all marks, stains, finger prints and splatters from such surfaces.
- (b) **Cleaning of all glass:** Cleaning and removing of all stickers, labels, stains, and paint from all glass, and the washing and polishing of same on interior and exterior.
- (c) **Cleaning or polishing of all hardware:** Cleaning and polishing of all hardware.
- (d) **Cleaning all tile, floor finish of all kinds:** Removal of all splatters, stains, paint, dirt,

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

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

C. OWNER'S RIGHT to CLEAN-UP

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

ARTICLE 49
LIQUIDATED DAMAGES

- A. Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including but not limited to interest and additional administrative, architectural, inspection and supervision charges. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.
- B. The Contract Documents may provide in the Construction Contract or elsewhere for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree that such amount is reasonable and agree to be bound thereby.
- C. If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.
- D. The amount of liquidated damages due under either paragraph B or C, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

ARTICLE 50
USE of FOREIGN MATERIALS

- A. In the performance of the Work the Contractor agrees to use materials, supplies, and products manufactured, mined, processed or otherwise produced in the United States or its territories, if same are available at reasonable and competitive prices and are not contrary to any sole source specification implemented under the Public Works Law.
- B. In the performance of the Work the Contractor agrees to use steel produced in the United States if the Contract Documents require the use of steel and do not limit its supply to a sole source pursuant to the Public Works Law. If the Owner decides that the procurement of domestic steel products becomes impractical as a result of national emergency, national strike, or other cause, the Owner shall waive this restriction.
- C. If domestic steel or other domestic materials, supplies, and products are not used in accordance with preceding Paragraphs A and B, the Contract Sum shall be reduced by an amount equal to any savings or benefits realized by the Contractor.
- D. This Article applies only to Public Works projects financed entirely by the State of Alabama or any political subdivision of the state.

ARTICLE 51
PROJECT SIGN

- A. Fully locally-funded State Agency and Public Higher Education projects: DCM Form C-15: Detail of Project Sign must be included in the project manual regardless of expected bid amount. If the awarded contract sum is \$100,000.00 or more, Contractor shall furnish and erect a project sign. Other conditions besides the contract sum may warrant waiver of this requirement, but only with approval of the Technical Staff.
- B. Fully locally-funded K-12 school projects: Project sign is not required unless requested by Owner; if project sign is requested by Owner, include DCM Form C-15: Detail of Project Sign in the project manual.
- C. Partially or fully PSCA-funded projects: DCM Form C-15: Detail of Project Sign must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of the contract sum. "Alabama Public School and College Authority" as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects.

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

END of
GENERAL CONDITIONS of the CONTRACT

1.0 - GENERAL

1.1 Summary

- A. This Section includes administrative and procedural requirements for alternates.
 - 1. Before submitting proposals, Bidders shall read entire specifications, including all divisions, and familiarize themselves with requirements respecting all Alternates, and also how each section of the work is affected by acceptance or omission of Alternates.
 - 2. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
 - 3. Bidders shall state on the Bid Form the amount to amend the Base Bid for making the following changes, including all incidental omissions, additions, and adjustments as may be necessary or required by such changes
- B. The Owner will award the Alternates in accordance with and as stated in The DCM Instructions to Bidders, 15. A - D and located at the front of this Project Specification Manual.
- C. Before signing the Contracts, the successful Contractor should be familiar with all Alternates and requirements. After signing the contracts, there will be no allowance or extra compensation paid to the Contractor because of omission or ignorance of said requirements.

1.2 Definitions

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 Procedures

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.

1.4 Schedule:

A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

ALTERNATE PRICES ARE REQUIRED AS FOLLOWS:

Alternate No. 1 (Additive): Allowance No. 1 for Kitchen Equipment

The amount to be added to base bid for providing Allowance No. 1

Alternate No. 2 (Addictive): Rolling Door:

The amount to be added to base bid for providing Rolling Door System as scheduled as Door Type 6. Under Base Bid, provide a finished masonry opening of size and condition to readily receive the same door system as a future endeavor.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

Drawings and general provisions of 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 governing handling and processing allowances.

Selected materials, services and equipment, and in some cases, their installation are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials, services and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order. **Allowances indicated shall be included in the Base Bid or Alternates as indicated.**

- B. Types of allowances required include the following:

1. Lump sum allowances.
2. Contingency allowance.

- C. Procedures for submitting and handling Change Orders are included in the General Conditions of the Contract, Article 43.

1.3 Selection and Purchase

At the earliest feasible date after Contract award, advise the Architect of the date when the final selection and purchase of each service, product or system described by an allowance must be completed in order to avoid delay in performance of the Work.

- A. When requested by the Architect, obtain proposals for each allowance for use in making final selections; including recommendations that are relevant to performance of the Work.
- B. Purchase products and systems as selected by the Architect from the designated supplier.
- C. Specific service providers, i.e., geotechnical and landscaping, shall be selected by the Owner.

1.4 Submittals

- A. Submit proposals for purchase of products or systems included in allowances. Reduction and addition in allowances shall be in the form specified for Change Orders.
- B. Submit invoices or delivery slips to indicate actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.5 Contingency Allowances

- A. Use the contingency allowance only as directed for the Owner's purposes, and only by written approval which designate amounts to be charged to the allowance.
- B. **With the exception of quantity allowances, all allowances indicated are contingency allowances and therefore the Owner may transfer balances for other discretionary uses. Overhead and profit margins SHALL NOT BE ADDED to any amount drawn from original Allowance(s) regardless of the indicated use.**
- C. Invoicing Procedures:
 - 1. Each contingency allowance shall be a "line item" on the Schedule of Values which is an attachment to the Application and Certificate for Payment as referenced in the "General Conditions of the Contract, Article 29.B".
 - 2. A copy of actual invoices paid by the Contractor and used against the respective Allowance(s), shall be included with the General Contractor's Application for Payment. This will allow all parties to know the remaining balance of Allowance(s) at all times.
 - 3. Overages:
Contractor shall submit to the Architect all costs associated with prior approved overages of Allowance(s). The Architect will prepare change order for these prior approved overages.
 - 4. Unused Balance:
Prior to final Application of Payment, Contractor shall submit total costs associated with Allowance(s). These costs should correspond with Schedule of Values from previous Applications for Payment plus any new charges. The Architect will prepare a change order to credit unused amounts. All 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%.

2.0 - PRODUCTS

Not applicable.

3.0 - EXECUTION

- 3.1 Inspection
Inspect products covered by an allowance promptly upon delivery for damage or defects.
- 3.2 Preparation
Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related construction activities.
- 3.3 Schedule of Allowances

Allowance No. 1: Include a general contingency allowance of \$25,000.00 under Alternate No. 1 for the Owner's use for additional kitchen equipment as directed by the Architect.

Allowance No. 2: Include a contingency allowance of \$150,000.00 under base bid for unseen conditions as directed by the Architect.

Allowance No. 3: Include a quantity allowance for providing a total of an additional 1 ton of in-place miscellaneous steel system construction not otherwise indicated, to be fabricated, primed, and installed at the direction of the Architect throughout the project at multiple locations of any divisible quantity denomination or location; including but not limited to: finished railings, clip angles, embeds, stair components, etc.

Allowance No. 4: Include a quantity allowance under base bid for providing an additional 2 tons of in-place medium – heavy structural steel system construction, not otherwise indicated, to be shop fabricated, primed and installed at the direction of the Architect throughout the project at multiple locations of any divisible quantity denomination or location; including but not limited to: lintels, beams, columns, shelf angles, edge angles, bent plates, rebar, joists, etc.

Allowance No. 5: Include a quantity allowance under base bid for providing a total of 200 cubic yards of additional removal of unsuitable soils and replacement of such with compacted structural fill. The grading indicated shall include the required cutting and filling of existing grade to the proposed subgrade elevation. The Owner's material testing agent shall determine if unsuitable soils are present. Unit prices are for establishing the value should it be necessary to increase or decrease the quantity per this Allowance. Refer to Section 02300.

Allowance No. 6: Include a contingency allowance of \$20,000.00 for the Owner's use in providing aid-to-construction to fund utility company expenses as directed by the Architect.

END OF SECTION

1.0 - GENERAL REQUIREMENTS

1.1 Related Documents

Drawings and general provisions of Contract, including General and Supplementary (Special) Conditions and Modifications and other Division - 1 Specifications Sections, apply to work of the Section.

1.2 Project / Work Identification

Project name is Addition and Renovations to Cafeteria at Salter Elementary School

A. Base Bid Requirements:

1. In general, the project shall consist of selective demolition and new construction including, but not limited to:

Site work, new single-level, concrete block wall construction, with brick veneer, aluminum windows and aluminum storefront system, TPO roof on structural concrete deck system, interior concrete block wall and paint finish, acoustical tile ceiling, vinyl floor finishes, kitchen equipment, plus plumbing, mechanical and electrical work as required to perform the work under this Contract for Salter Elementary School and to properly join, connect and finish the new work to bring all to final, finished completion in first class manner ready for use by the Owner, all in strict accordance with Contract Documents including plans and specifications as prepared by Lathan Associates Architects, P. C., Hoover, Alabama; and shall include the furnishing of all labor, materials, equipment and services necessary for the proper completion of the building and other work as called for in the drawings and / or specifications dated July 8, 2022.

2. The Base Bid shall include all work shown or specified.
3. See Section 01010 for Alternates.
4. See Section 01020 for Allowances.
5. It is the intent and requirement under this Contract to accomplish all demolition and preparation necessary to perform the Work under this Contract and to properly join, connect and finish the new work to bring all to final, finished completion in first class manner ready for use by Owner.

B. Contractor's Duties: Except as specifically noted, provide and pay for:

1. Labor, materials and equipment.
2. Tools, construction equipment and machinery.
3. Water, heat, conditioning and utilities required for construction shall be provided by the Contractor.
4. Other facilities and services necessary for the proper execution and completion of the Work. Including hoist if same required for access to site. Provide own telephone service and sanitary portable toilet facilities.
5. Secure and pay for permits, impact fees, government fees, and licenses. This will include, but not be limited to, all permits required by ADEM, the

U.S. Army Corp of Engineers and all fees required by State of Alabama, Division of Construction Management.

6. Give required notices.
7. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of the Work.
8. Promptly submit written notice to the Architect of observed variance of Contract Documents from legal requirements. It is not Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations.
9. Enforce strict discipline and good order among employees. Do not employ unfit persons or persons not skilled in assigned tasks. **Smoking is prohibited on site.**
10. **Comply with Owner's Covid-19 safety measures, and requirements.**
11. It is intended that all items and systems shown or specified be furnished and installed complete and fully operational when all work is in place and in use. Where more than one trade is involved, the General Contractor shall be responsible for coordination and resolution of disputes between his subcontractors and material suppliers regarding responsibility for furnishing and installing individual parts, systems, materials, connections, proper separation, hardware, adapters, surface preparation, relationship conflicts, supports, blocking and all similar items required for the complete and fully functional weathertight installation of the work.

C. Related Contract Documents:

Related requirements and conditions that are indicated on the Contract Documents include, but are not necessarily limited to, the following:

1. Existing site conditions and restrictions on use of the site.
2. Alterations and coordination with existing work.
3. Work to be performed concurrently by the Owner.
4. Work to be performed concurrently by separate contractors.
5. Work to be performed subsequent to work under this Contract.
6. Equipment / Material assigned as work of the Contract.
7. Requirements for partial Owner occupancy prior to substantial completion of the Contract Work.
8. Safety for and protection for occupancy, operation of existing facilities and construction to remain.

D. Summary by References:

Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary (Special Requirements) Conditions, Specification Sections, Drawings, addenda and modifications to the Contract Documents issued

subsequent to the initial printing of the project manual and including, but not necessarily limited to, printed material referenced by any of these.

It is recognized that 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.

- E. The Owner may provide certain items of furniture, equipment, etc. Coordinate for utility rough-in and / or installation.

1.3 Contractor's Use of Premises:

A. General:

During the entire construction period the Contractor shall have the exclusive use of that portion of the phased contract work limits for construction operations, in accord with approved phasing plan schedule.

The Contractor shall limit his use of the premises to the work indicated, so as to allow for Owner occupancy and use by the public.

Use of the Site:

Confine operations at the site to the areas and limits permitted under the Contract and by law, ordinances, permits, and special conditions and special project procedures and coordination sections of the documents. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

1. Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Do not use these areas for parking or storage of materials.
2. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off site. Storage of material in the phased contract work limits shall be confined to noncombustible / non-hazard material that is scheduled for immediate use (no longer than 24 hour storage).
3. Lock 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. Release hydraulic pressure when equipment is not in use. All vehicles delivering materials to the site shall be manned at all times, no exception.

- B. Confine operations at site to areas and limits permitted by law, ordinances, permits, Contract Documents and SUPPLEMENTARY CONDITIONS.
- C. Assume full responsibility for insurance, protection and safekeeping of products stored on premises.
- D. Coordinate with the Owner and schedule deliveries and unloading to prevent traffic congestion blocking of access or interference with Work. Arrange deliveries to avoid larger accumulations of materials than can be suitably stored at site.
- E. Contractor to pay for, or satisfactorily repair, all damages incident to their Work, to sidewalks, streets, other public or private property, or to any public utilities occurring

during period of work under Contract.

- F. Owner furnished and installed items that may require coordination between this General Contractor and Owner assigned agent. Contractor should also verify requirements for utility rough-ins for Owner furnished equipment.
- G. Contractor shall maintain all existing adjacent building exits passable for emergency pedestrian egress.
- H. **Comply with Owner's Covid-19 safety measures, and requirements.**

1.4 Owner Occupancy / Partial Owner Occupancy:

The Owner reserves the right to place and install equipment as necessary in completed areas of the building and to occupy such completed areas prior to substantial completion, provided that such occupancy does not substantially interfere with completion of the work. Such placing of equipment and partial occupancy shall not constitute acceptance of the work or any part of the work.

1.5 Alterations and Coordination:

A. General:

The work of this contract includes coordination of the entire work of the project, including preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from beginning of construction activity through project close-out and warranty periods.

B. Alterations:

Where applicable, requirements of the Contract Documents apply to alteration work in the same manner as to new construction.

C. General:

To expedite delivery and for other purposes in his own best interests, the Owner, before the date of the Contract, may negotiate purchase orders or make other commitments with supplies of material and equipment to be incorporated into the work by the Contractor. These purchase orders and commitments will be assigned to the Contractor for installation.

1.6 Miscellaneous Provisions (to include, but not be limited, by the following):

- A. Provide all rough-in and utility connections for all Owner Furnished Equipment and all new plumbing fixtures, new kitchen equipment and for all new electrical fixtures, switches and outlets, etc.
- B. Complete Plumbing, Heating, Ventilating, Air Conditioning, and Electrical systems.
- C. Preparation of new finishes as called for in Finish Schedule and related specified Sections.
- D. Rework and refinish those areas including ceiling tile and grid disturbed by work of Divisions 15 and 16, cutting and patching as required for these specifications. Strict coordination with the Architect and Owner's assigned project representative is mandatory.
- E. Mechanical / Electrical Requirements of General Work:
 - 1. General:

Except as otherwise indicated, comply with applicable requirements of Division 15 Sections for mechanical provisions within units of general (Division 2 - 14) Work. Except as otherwise indicated, comply with applicable requirements of Division 16 Sections for electrical provisions within units of general (Division 2 - 14) Work.

Service Connections: Refer to Division 15 and Division 16 Sections for the characteristics of the mechanical and electrical services to be connected to units of general work. Provide units manufactured or fabricated for proper connection to and utilization of available services.

Except as otherwise indicated, final connection of mechanical services to general work is defined as being mechanical work, and final connection of electrical services to general work is defined as electrical work.

2. Electrical Requirements:

Except as otherwise indicated, comply with applicable provisions of The National Electrical Code (NEC) and standards by National Electrical Manufacturer's Association (NEMA), for electrical components of general work. Provide Underwriters Laboratories listed and labeled products where applicable. See Division 16 and electrical drawings.

F. Performance Requirements for Completed Work

The Contract Documents indicate the intended occupancy and utilization of the building and its individual systems and facilities. Compliance with governing regulations is intended and required for the work and for the Owner's occupancy and utilization. In addition to the requirement that every element of the work comply with applicable requirements of the contract documents, it is also required that the work as a whole comply with the general building performance requirements.

1.7 Utilities for Construction:

Make all arrangements necessary to connect to all utilities required to accomplish work under this contract. The Contractor will be solely responsible for connection to utilities required for construction of this Contract.

A. The Owner shall pay for water and electricity usage bills required for normal construction purposes.

B. The Contractor shall provide reasonable heat, cooling and ventilation within the building as required until the mechanical system has been completed, connected and in operation in the normal sequence of construction. This is not "in addition" to any normal requirement for heating, cooling and ventilation under this Contract, but is to clarify that a subcontractor or a Separate Contractor may benefit from the existence of these systems.

C. Temporary Electrical Lighting and Power:

Until permanent electrical power is installed and until the building lighting fixtures are installed in the normal sequence of construction, the General Contractor will make available in each general area of the contract work, outlets to which the Separate Contractors may connect for temporary lighting and single phase electrical power. The General Contractor will pay all costs for this temporary utility extension and remove this temporary source when permanent electrical lighting and power outlets are installed. When, in the normal sequence of construction, the building lights are installed and connected and the building electrical outlets installed, the use of these shall be available for use by the subcontractor and/or Separate Contractors at no cost to them. All temporary electrical lighting and power for Separate Contractors

shall be single phase, except the General Contractor will provide sufficient three-phase service as required for the operation and testing of certain items of Equipment, such as food service equipment. Verify all electrical service and phasing prior to construction.

1.8 Requirements of Separate Contractors will be as follows:

- A. Separate Contractors to enter the building site to accomplish his work at the approval of the building General Contractor shall cooperate and coordinate with the General Contractor and shall be subject to the General Contractor as to schedule and locations within the site for him to accomplish his work. The General Contractor is responsible for and is in charge of the building site.
- B. The Separate Contractor is entitled to storage, access and work space inside the building in the same manner and subject to the same conditions and requirements as subcontractors for the building contract. The Separate Contractor will be advised of the availability of storage space (location coordinated by the General Contractor), and of responsibility to vacate and clean in time for final finish work.
- C. Separate Contractors are liable for any damage to the building. The Separate Contractor shall immediately make good any stain, harm or damage to the building caused by his forces. Most particularly, his attention is directed to need for caution in not damaging ceiling tile and wall finishes. Before final payment will be made to a Separate Contractor, he must have settled with the building General Contractor for any damage done.
- D. Separate Contractor must provide own toilet and telephone facilities (or make arrangements with the General Contractor as to pay rent for his share of cost).
- E. Separate Contractor to make provisions for his own safety and to accomplish his work in compliance with all National and Local Safety Regulations.
- F. Remove own trash and debris; each Separate Contractor to completely remove all trash and debris, caused by his work, from the building, and from the site.
- G. Do not allow dust to be exhausted through mechanical system.
- H. This Contractor to clean building exterior and interior as outlined in Section 01700-CLEAN UP.

1.9 Quality Control

- A. Shop Drawings and Product Approval:
Compliance with Shop Drawing checking by the Contractor then submittal for approval to the Architect as required by GENERAL CONDITIONS and SUBMITTALS - SECTION 01350 .
- B. Material Approval:
Compliance with SUBMITTALS - SECTION 01350 for submittal of products for approval by Architect before delivery of same to jobsite.
- C. Qualifications of Workmen:
In acceptance or rejection of the work of the Sections specified herein, and in particularly that work involved with the application of finish materials, the Architect will make no allowance for lack of skill on the part of the workmen.

D. Special Inspections:

Compliance with special inspection requirements of the International Building Code is the responsibility of the General Contractor.

1.10 Patch and Repair Work:

Patch and Repair work under this Contract (in addition to work specified and indicated on the drawings) shall include, but not be limited to, the following:

Maintain fire integrity of walls, floors, ceilings and structure where piercing or openings are made. Use safing material as specified herein for approved UL poke-through applications.

1.11 N.I.C. Items:

Items noted as Not In Contract (N.I.C.) are to be furnished by Owner.

END OF SECTION

SPECIAL PROJECT PROCEDURES - SECTION 01035

1.0 Requirements

As set forth herein are applicable to the Work under every Section or Division of this Specification, of the General Contractor and all Subcontractors.

1.1 Completion Date

Work under this contract shall be sufficiently completed to permit Owner to occupy the building, or a designated portion thereof, on or before date stipulated on the Proposal Form and accepted by Owner. See Paragraph entitled Time For Completion under SPECIAL PROJECT REQUIREMENTS, SECTION 01030.

1.2 Acceptance of Preceding Work

Before starting any operation, Contractor and each Subcontractor shall examine existing work performed by others to which his work adjoins. Failure to remedy faults in or notify Architect of deficiencies or faults in preceding work will constitute acceptance thereof and waiver of any claim of its unsuitability.

1.3 Layouts and Levels

General Contractor shall establish principal lines, grades, levels and corners, and shall set and maintain adequate reference points therefore. Contractor shall lay out own work to dimension from principal lines and shall be responsible for layout of his subcontractor's work.

1.4 Product Approval

A. In addition to items submitted for approval by Shop Drawings, Contractor to submit for approval within ten (10) days after receipt of Notice to Proceed a list of all products proposed for use in the work, listing manufacturer, make, model number, catalog listing subcontractors' and / or vendors' names, and other manufacturers' identification for each particular product for each particular use. Submit in letter form in 3 copies, and approval obtained before material is ordered. Submit list of products requiring color selection. Approved list of products manufacturer and / or vendor will be returned promptly in order to avoid any delay of ordering materials specified. General Contractor shall review with Architect and the Owner the actual status of availability of all materials and schedule of work in the building, (including Alternates).

B. Submit complete Product Data and testing results, if requested.

1.5 Weather Protection

Contractor provide, maintain and pay all cost for all weather protection required to properly protect all parts of structure from damage during construction. Note that building heating and cooling system will remain in operation throughout the contract period.

1.6 Manufacturer's Directions

A. Apply, install, connect and erect manufactured items or materials according to recommendations of manufacturer when such recommendations are not in conflict with Contract Documents.

B. Furnish to Architect, on request, copies of manufacturer's recommendations. Secure approval of recommendations before proceeding with work.

ALL MANUFACTURED ITEMS THAT ARE STRUCTURAL IN NATURE SHALL BEAR THE SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF ALABAMA AND SUBMITTED FOR APPROVAL.

1.7 Coordination Between Trades: Contractor's Pre-Construction Coordination Meeting

A. Plumbing, Heating, Ventilating, Air Conditioning and Electrical Drawings are diagrammatic.

- B. BEFORE COMMENCING WORK UNDER THIS CONTRACT, GENERAL CONTRACTOR IS TO ARRANGE FOR A MEETING OF ALL MAJOR SUBCONTRACTORS (AND SEPARATE CONTRACTS AS APPLICABLE) TO DETERMINE THAT ALL ITEMS WILL FIT INTO SPACES PROVIDED, HEADROOMS MAINTAINED, CONCEALMENT REQUIRED, WALL THICKNESS SUFFICIENT FOR RECESS OF ITEMS, PRIORITIES ESTABLISHED IN INSTALLATION OF DUCTS, PIPING, ETC. EACH SUBCONTRACTOR MUST HAVE THEIR RESPECTIVE ON-SITE JOB FOREMAN PRESENT. Each Subcontractor to have drawings of all trades, and to be completely aware of and fully informed of, requirements and locations of work to be installed by other Subcontractors. In case of disagreements in locations, General Contractor is to settle same, giving preference to ductwork and larger items, except where grading of pipe may require preference. All decisions to be recorded on each Subcontractor's drawings and on jobsite set of drawings and fully inform all Subcontractors. No changes to be made which affect finish locations or alter requirements of contract without approval of the Architect. Do not cover or block previously installed alarm devices, valves, etc., without providing for access to same.
- C. If, in any location, it is impossible to install required items and maintain requirements as to ceiling heights, clearances dimensions, etc., or due to structural interference, General Contractor is to advise Architect for a decision.

1.8 City Ordinances

- A. Comply with all City rules, regulations and ordinances in regard to parking, unloading, blocking of street, sidewalk or alley; and provide all lights, barriers, temporary walkways, protection, etc., as necessary for complete compliance.
- B. Comply with applicable Code and all local and Federal laws and ordinances in regard to safeguards during construction and fire protection, and all governing regulations pertaining to requirements during construction.

1.9 Operating and Maintenance Instructions

- A. Contractor shall instruct Owner's operating personnel in proper operation, lubrication and maintenance of all equipment items installed under this contract.
- B. At completion of job, Contractor shall provide three (3) copies of a brochure containing manufacturer's operating, lubricating and maintenance instructions and parts lists for each item of equipment furnished under this contract. Each copy shall be assembled and bound under a substantial hardboard cover with title and index. Provide a complete set of approved manufacturer's and contractor's shop and equipment "setting" drawings for major systems and equipment furnished under this contract.

One (1) copy of the Operating and Maintenance instructions shall be hand delivered to the Architect at the final inspection and the remaining copies shall be provided to the Owner prior to issuance of the Certificate of Substantial Completion

1.10 Site Limitation and Use

- A. General Contractor and each Subcontractor shall note the extent of site available for access and storage. Contractor restricted to those limits.
- B. All personnel required on the job site must at all times be in possession of **state issued** photo identification subject to examination by Owner or their representative. Other security requirements may also be in place and is the responsibility of the General Contractor to abide by all school rules.
- C. Contractor and Subcontractors are further cautioned that the traffic on adjacent streets may place strict limitations on the rates and means of delivery of materials, equipment and

supplies, the removal of rubbish, and, in some cases, the hours during which deliveries are made.

1.11 Protection of Existing Property Adjacent

A. Protect and cause no damage to adjacent area and site.

During progress of work, Contractor will be responsible for full and complete protection of property which the work is being done, insofar as related to work under this Contract. Any damage to adjacent property, or contents caused by failure in performance with these requirements must be made good by Contractor at his own expense and to the satisfaction of Owner. Any damage to existing adjacent areas outside contract work limits shall be replaced with exact same materials as that damaged.

B. Provide for means to prevent objectionable dust and debris blowing onto adjacent property or streets from work being accomplished under this contract.

1.12 Dimensions

Contractor and each Subcontractor shall verify dimensions at site for built-in work, for work adjoining that of other trades and for dimensions shown to existing structures or installations. Notify Architect of any discrepancies.

1.13 Security of Construction Area

Contractor shall secure on site storage of materials and equipment. Storage of materials shall be within the Contractor's limit of construction at the site. This General Contractor shall adhere to Owner's requirements for security of work area and under all conditions shall be subject to these security regulations and requirements. Off-site storage of materials and equipment that are to be installed in the project shall be in a bonded storage area as outlined in the General Conditions.

1.14 Delivering and Storage

A. Deliver packaged materials to site in manufacturer's original, unopened and labeled containers. Do not open containers until approximate time for use.

B. Store materials in a manner that will prevent damage to materials or structure, and that will prevent injury to persons. No materials will be stored outside of contract work area by this Contractor.

C. Store cementitious materials in dry, weathertight, ventilated spaces. Store ferrous materials to prevent contact with ground and to avoid rusting and damage from weather.

1.15 Fire Protection

Contractor to take all necessary steps to ensure prevention of fire. Contractor to have portable extinguishers on hand at site throughout the period of construction. Flammable and combustible materials shall be kept in metal cans with tight covers and removed from building at end of each working day.

Fire protection systems within existing buildings must be maintained in full operation during construction.

1.16 Hoist, Ramps, Elevator Access, etc.

Furnish and Maintain as Necessary: Hoists, ramps, railings, platforms, etc., required in conformance with local applicable regulations. Hoists shall be operated by qualified and experienced mechanics. Space for hoist shall be coordinated with Architect and Owner's assigned project representative.

1.17 Chases and Openings

Provide all proper chases, openings and recesses as indicated for work under this Contract. Build in all sleeves, anchors, etc., for proper engagement of work to be installed. All post piercing of slabs and masonry shall be core drilling.

END OF SECTION

1.0 - GENERAL REQUIREMENTS

1.1 Related Documents

Drawings and general provisions of Contract, including General and Supplementary Conditions (plus modifications thereto), and other Division 1 Specification sections, apply to work of this section.

1.2 Description of Work

Minimum administrative and supervisory requirements necessary for coordination of work on the project include, but are not necessarily limited to, the following:

- A. Coordination and meetings.
- B. Administrative and supervisory personnel.
- C. Surveys and records or reports.
- D. Limitations for use of site.
- E. Special reports.
- F. General installation provisions.
- G. Cleaning and protection.
- H. Conservation and salvage.
- I. Special inspections.

1.3 Coordination and Meetings

A. General

Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each entity performing work at the project site. Prepare similar memorandum for separate contractors where interfacing of their work is required.

B. Coordination Drawings

Prepare coordination drawings where work by separate entities requires fabrication off-site of products and materials which must accurately interface. Coordination drawings shall indicate how work shown by separate shop drawings will interface, and shall indicate sequence for installation.

C. Bi-Weekly Coordination Meetings

Hold bi-weekly general project coordination meetings at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Conduct meetings in a manner which will resolve coordination problems. Record results of the meeting and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

- D. At Contractor's option, bi-weekly coordination meetings can be held integrally with progress meetings.

1.4 Administrative / Supervisory Personnel

A. General

In addition to a General Superintendent and other administrative and supervisory personnel required for performance of the work, provide specific coordinating personnel as specified herein.

B. Project Coordinator

Provide a full-time Project Coordinator experienced in administration and supervision of building construction, including mechanical and electrical work. This Project Coordinator is hereby authorized to act as general coordinator of interfaces between units of work. For the purpose of this provision, "interface" is defined to include scheduling and sequencing of work, sharing of access to work spaces, installation, protection of each other's work, cutting and patching, tolerances, cleaning, selections for compatibility, preparation of coordination drawings, inspections, tests, temporary facilities and services, scheduling and sequencing of mechanical / electrical work, integration of work placed into limited spaces available for mechanical / electrical installations, each trades' protection of work by other trades and preparation of mechanical / electrical coordination drawings.

1.5 Surveys and Records / Reports

A. General

Establish markers to set lines and levels for work as needed to properly locate each element of the project. Calculate and measure required dimensions as shown within recognized tolerances. Drawings shall not be scaled to determine dimensions. Advise entities performing work of marked lines and levels provided for their use.

B. Survey Procedures

Before proceeding with the layout of actual work, verify the layout information shown on the drawings, in relation to the existing partitions and conditions. As work proceeds, check every major element for line, level and plumb. Maintain a record of such checks; make this record available for the Architect or Engineer. Record deviations from required lines and levels, and advise the Architect or Engineer promptly upon detection of deviations that exceed indicated or recognized tolerances. Record deviations which are accepted, and not corrected, on record drawings.

1.6 Limitations on Use of the Site

A. General

Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

B. See also specific requirements of SECTION 01030 - SPECIAL PROJECT REQUIREMENTS and SECTION 01035 SPECIAL PROJECT PROCEDURES.

1.7 Special Reports

A. General

Submit special reports directly to the Owner through the Architect within one day of an occurrence. Submit a copy of the report to the other entities that are affected by the occurrence.

B. Reporting Unusual Events

When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List chain of events, persons participating, response by the Contractor's personnel, and evaluation of the results or affects and similar pertinent information. Advise the Owner in advance when such events are known or predictable.

C. Reporting Accidents

Prepare and submit reports of significant accidents at the site and anywhere else work is in progress. Record and document data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

2.0 -PRODUCTS

Not applicable.

3.0 - EXECUTION

3.1 General Installation Provisions

A. Pre-Installation Conferences

Hold a pre-installation meeting at the project site well before installation of each unit of work which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in, or affected by, that unit of work, and with its coordination or integration with other work that has preceded or will follow shall attend this meeting. Advise the Architect / Engineer of scheduled meeting dates.

1. At each meeting review progress of other work and preparations for the particular work under consideration including specific requirements for the following:

Contract documents.
Options.
Related change orders.
Purchases.
Deliveries.
Shop drawings, product data and quality control samples.
Possible conflicts and compatibility problems.
Time schedules.
Manufacturer's recommendations.
Compatibility of materials.
Acceptability of substrates.
Temporary facilities.
Space and access limitations.
Governing regulations.
Safety.
Inspection and testing requirements.
Required performance results.
Recording requirements.
Protection.

2. Record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. Distribute the record of meeting promptly to everyone concerned, including the Owner and Architect / Engineer.
3. Do not proceed with the work if the pre-installation conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest feasible date.

B. Installer's Inspection of Conditions

Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

C. Special Inspections

Coordinate and schedule for Special Masonry Inspections with Masonry Contractor and Owner's Inspector as required to comply with current Building Codes. All grout placement for CMU walls shall be witnessed by the Special Inspector.

D. Manufacturer's Instructions

Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than the requirements indicated in the contract documents.

E. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

F. Provide attachment and connection devices and methods for securing work. Secure work true to line and level and within recognized industry tolerances. Allow expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual-effect choices to the Architect / Engineer for final decision.

G. Recheck measurements and dimensions of the work as an integral step of starting each installation.

H. Install each unit-of-work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration.

I. Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering work for that purpose.

J. Mounting Heights

Where mounting heights are not indicated, mount individual units of work at industry recognized standard and A.D.A. acceptable mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect / Engineer for final decision. For mounting heights on Owner Furnished Equipment, Contractor shall obtain accurate information from data supplied by Owner or from field measurements of actual equipment to be relocated and installed.

3.2 Cleaning and Protection

A. General

During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

B. Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure proper operation without damaging effects.

C. Limiting Exposures of Work

To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation, to the following:

Excessively high or low temperatures.

Thermal shock.

Excessively high or low humidity.

Water or ice.

Solvents.

Chemicals.

Electrical current.

Incompatible interface.

Misalignment.

Unprotected storage.

Theft.

Vandalism.

3.3 Conservation and Salvage

It is a requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials.

END OF SECTION

1.0 - GENERAL REQUIREMENTS

1.1 Related Documents

Drawings and General Provisions of Contract, including General and Supplementary Conditions (plus modifications thereto), and other Division 1 Specification Sections, apply to work of this Section.

1.2 Description of Requirements

A. Definition

"Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

1. "Cutting and patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
2. Cutting and patching performed during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".

- B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

Unless otherwise specified, requirements of this section apply to mechanical and electrical work. Refer to Division 15 and Division 16 Sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.3 Quality Assurance

A. Requirements for Structural Work

Do not cut and patch structural work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio.

- B. Before cutting and patching the following categories of work, obtain the Architect / Engineer's approval to proceed with cutting and patching as described in the procedural proposal for cutting and patching.

1. Structural steel.
2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories or work.
3. Structural concrete.
4. Bearing walls.
5. Structural decking.
6. Exterior wall construction.
7. Piping, ductwork, vessels and equipment.
8. Structural systems of special construction, as specified by Division 13 Sections.

- C. **Where new work is indicated to interface with an existing roofing system or other systems potentially under current warranty, the Contractor shall coordinate as required to verify and provide new work in such manner and with such resources as to maintain the Owners current warranty accordingly without compromise.**

D. Operational and Safety Limitations

Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life or decreased safety.

E. Before cutting and patching the following elements of work, and similar work elements where directed, obtain the Owner's approval through the Architect / Engineer to proceed with cutting and patching as proposed in the proposal for cutting and patching. Note fourteen (14) day prior notice requirement of Owner.

1. Primary operational systems and equipment.
2. Noise and vibration control elements and systems.
3. Control, communication, conveying and electrical wiring systems.

F. Visual Requirements

Do not cut and patch work exposed on the building's exterior or in its occupied spaces in a manner that would, in the Architect's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patch work. Remove and replace work judged by the Architect to be cut and patched in a visually unsatisfactory manner.

1.4 Submittals

A. Procedural Proposal for Cutting and Patching

Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:

1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.
2. List products to be used and firms that will perform work.
3. Give dates when work is expected to be performed.
4. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out-of-service temporarily. Indicate how long utility service will be disrupted. Request day and time desired for disruption of services.
5. Where cutting and patching structural work involves the addition of reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with original structure to satisfy requirements.
6. Approval by the Architect / Engineer to proceed with cutting and patching work does not waive the Architect / Engineer's right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.

2.1 Materials

Except as otherwise indicated, or as directed by the Architect / Engineer, use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

3.0 - EXECUTION

3.1 Inspection

- A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.
- B. Before the start of cutting work, meet at the work site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict between the various trades. Coordinate layout of the work and resolve potential conflicts before proceeding with the work.

3.2 Preparation

- A. Temporary Support
To prevent failure, provide temporary support of work to be cut.
- B. Protection
 - 1. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
 - 2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- C. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.3 Performance

- A. General
Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect / Engineer, proceed with cutting and patching at the earliest feasible time and complete work without delay.
- B. Cutting
 - 1. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.
 - 2. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
 - 3. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in walls or partitions to be removed.

After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

C. Patching

1. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
2. Where feasible, inspect and test patched areas to demonstrate integrity of work.
3. Restore exposed finishes of patched areas and, where necessary, extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
4. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.
5. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.
6. Patch and repair existing plaster / gypsum board ceilings as necessary to provide an even plane surface of uniform appearance.

3.4 Cleaning

Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

TEMPORARY FACILITIES AND CONTROLS - SECTION 01200

1.0 GENERAL REQUIREMENTS

Temporary facilities and controls required for this project include, but are not necessarily limited to, the following:

1.1 Temporary Structures

- A. Provide and maintain field office separate from the project of not less than 200 sq. ft. in area equipped with the following:
 - 1. Heater or air conditioner as required by weather.
 - 2. Telephone service.
 - 3. Computer with ability and service to send/receive email.
 - 4. Printer
 - 5. Adequate lighting.
 - 6. Plan table, 36" x 60" minimum (2)
 - 7. Plan rack.
 - 8. Desk and chair with lockable file drawer in desk.
 - 9. Toilet facilities: Provide 1 water closet and 1 lavatory.
 - 10. Computer system capable of sending/receiving emails with printer.
- B. Within the Contractor's facilities, provide enclosed space adequate for holding weekly project meetings. Furnish with all required tables, chairs and utilities.
- C. The entire facility, including furniture, will remain the property of the Contractor and shall be maintained at the site until 100% completion of the Work.
- D. Portable office or trailer meeting above requirements acceptable pending local approval.

1.2 Temporary Facilities

- A. Temporary water and electrical service connections will be provided by General Contractor. This Contractor shall make necessary connections and provide conductors and furnish and install area distribution boxes so located that the individual trades may use 30m (100') maximum length extension cords to obtain adequate power and artificial lighting at all points where required for the Work, and for inspection and safety.
- B. Cost of temporary water and electric connections and conductors shall be borne by Contractor.
- C. Provide temporary toilets in portable units. Toilets must meet standards of the County Public Health Department. Toilets shall be maintained for the duration of the project.
- D. Remove temporary utilities on completion of construction.

1.3 Temporary Scaffolds, Lifts, Staging and Stairs

Provide scaffolds, lifts, staging, stairs, ramps, ladders, runways, platforms, hoists and guard rails necessary for execution of construction. Comply with recognized safety rules and prevailing laws or ordinances. Remove on completion of construction.

1.4 Protective Barricades and Temporary Walkways

- A. Contractor to provide and maintain all necessary temporary barricades, covers, enclosing fences, walkways, scaffolds, guards, street barricades, etc., in accordance with requirements of SPECIAL PROJECT REQUIREMENTS - SECTION 01030.

Height and location to be in compliance with local codes and ordinances. Provide adequate warning signs and warning lights.

- B. Materials for construction shall be substantial, sound, all of good appearance, straight, in line, unyielding, complete, well installed, braced and adequate for use intended. All to comply with requirements of local codes and ordinances including the International Building Code. Provide and install gates and doors in enclosing barricade as required.
- C. Remove upon completion of the work.

1.5 Construction Fence

- A. Provide 6'-0" high chain link fence around area of work, around staging area, and/or material storage area(s) as directed and/or as deemed necessary for safety. Fence shall be supported on steel posts and maintained in good condition throughout contract period. Remove fence when contract is completed and repair any site damage caused by fence and posts.
- B. Fence adjacent to pedestrian and traffic areas as required to safely maintain ongoing school operations subject to the Site Limits and approval of the Owner and the Architect.
- C. Provide lockable gates (truck gates and pedestrian gate as required). Locate at Contractor's option. Keep gates closed except during actual ingress and egress.
- D. Route fence in behind existing fire hydrants to keep available from street side at all times.

1.6 Protection

Conform to requirements of "Safety & Protection of Persons and Property", in GENERAL CONDITIONS.

1.7 Maintaining Traffic

- A. Do not close or obstruct streets, sidewalks, alleys and passageways without permit. Do not place or store material in streets, alleys or passageways.
- B. Conduct operations with minimum interference to roads, streets, driveways, alleys, sidewalks and facilities, except as noted herein.
- C. Provide, erect and maintain lights, barriers and the like required by traffic regulations or local laws.

1.8 Protection of Structure and Property

- A. Execute work to ensure adjacent property against damages which might occur from falling debris or other cause; do not interfere with use of adjacent property. Maintain free, safe passage to and from same.
- B. Take precautions to guard against movement, settlement or collapse of any sidewalks or street passages adjoining property; be liable for any such movement, settlement or collapse; repair promptly such damage when so ordered.

1.9 Project Signs

Allow no signs or advertising of any kind on the job site except as specifically approved in advance by the Architect.

1.10 Maintenance and Removal

Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work. Remove all such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Architect.

END OF SECTION

1.0 - GENERAL REQUIREMENTS

1.1 Related Documents

Drawings and general provisions of Contract, including General and Supplementary (Special) Conditions, and modifications thereto, and other Division 1 Specifications Sections, apply to work of this Section. See Special Project Requirements Section 01030 for pre-installation meetings and pre-finishes meeting.

1.2 Description of Requirements

A. General

Required inspection and testing services are intended to assist in the determination of probable compliance of the work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the Contract Documents.

B. Definitions

The requirements of this section relate primarily to customized fabrication and installation procedures, not to the production of standard products. Quality control services include inspections and tests and related actions including reports performed by independent agencies and governing authorities, as well as directly by the Contractor. These services do not include Contract enforcement activities performed directly by the Architect or Engineer.

1. Specific quality control requirements for individual units of work are specified in the sections of these specifications that specify the individual element of the work. These requirements, including inspections and tests, cover both production of standard products and fabrication of customized work. These requirements also cover quality control of the installation procedures.
2. Inspection, tests and related actions specified in this section and elsewhere in the Contract Documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.
3. Requirements for the Contractor to provide quality control services as required by the Architect / Engineer, the Owner, governing authorities or other authorized entities are not limited by the provisions of this section.

1.3 Responsibilities

A. Testing

Owner shall employ and pay for testing services except where tests are specifically indicated as being the contractor's responsibility.

B. Re-Test Responsibilities

Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance or related work with the requirements of the Contract Documents, then re-tests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Re-testing of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original work.

C. Responsibility for Associated Services

The Contractor is required to cooperate with the independent agencies performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include, but are not necessarily limited to, the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of samples to test laboratories.
4. Security and protection of samples and test equipment at the project site.

D. Coordination

The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the work. In addition, the Contractor and each independent testing agency shall coordinate their work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

1.4 Quality Assurance

Qualification for Service Agencies: Except as otherwise indicated, engage inspection and test service agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which are recognized in the industry as specialized in the types of inspections and tests to be performed.

1.5 Submittals

A. General

Refer to Division - 1 Section of "Submittals" for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect / Engineer, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

B. Report Data

Written reports of each inspection, test or similar service shall include, but not be limited to, the following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.
6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on re-testing, if applicable.

2.0 - PRODUCTS

Not applicable.

3.0 - EXECUTION

3.1 Repair and Protection

Upon completion of inspection, testing, sample-taking and similar services performed on the work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

1.0 - GENERAL

- A. Summary: Shop drawings may be transmitted for approval by electronic format or by hard copies.

1. Digital Copies:

- a. Shop drawing and product data submittals shall be transmitted to Architect's office in electronic (PDF) format via email at submittals@lathanassociates.com. Do not email or copy transmittals to Architect or engineer.
- b. The intent of electronic submittals is to expedite the construction process by reducing paperwork and improving information flow.
- c. **The electronic submittal process is not intended for color samples, color charts, or physical material samples.**
- d. After receiving approved digital submittals, **General Contractor is responsible for printing and delivering 2 hard copies of the approved shop drawings to the Architect within 10 days.** Submittals are not considered complete until 2 copies have been received by the Architect. This may have a direct effect on pay requests or final payment.
- e. The Architect will retain the two (2) hard copies of shop drawing submittals: one for project records, and one to be incorporated with Close-Out Documents for the Owner.
- f. Prior to submitting electronic submittals, GC must sign electronic submittal agreement. Project will be either all electronic or all hard copy. We will not accept electronic submittals once we have begun with hard copies. A copy of this agreement is attached to this section.

DIGITAL file name shall include Architect Job No, Specification Section number and description. (e.g., 15-01, 06100 - Rough Carpentry). We will not accept files that are randomly named. (e.g. scan 1234 or from Xerox Copier, etc.) Digital submittals must still be stamped approved or approved as noted.

B. Submittal Procedures:

1. Coordinate submittals preparation with construction, fabrication, other submittals and activities that require sequential operations. Transmit in advance of construction operations to avoid delay.
2. Coordinate submittals for related operations to avoid delay because of the need to review submittals concurrently for coordination. The Architect reserves the right to withhold action on a submittal requiring coordination until related submittals are received.
3. Processing: General Contractor must review and approve shop drawings and submittals prior to submitting to Architect. Allow the Architect no less than three (3) weeks for initial review. Allow more time if the Architect must delay processing to permit coordination with the sequence of construction, related specification divisions and finishes to be selected in comparison, engineers, consultants and owner's representatives. Allow no less than two (2) weeks for reprocessing.

NOTE: No extension of Contract Time and/or additional costs will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

4. Submittal Preparation: The following information must be included with each transmittal.
 - a. Date
 - b. Project name and architect's project number.
 - c. Name of the General Contractor and contact within company.
 - d. Subcontractor name.
 - e. Supplier name.
 - f. Description of item.
 - g. Specification Section and name of that section.
 - h. Name of the Manufacturer - Model / Style of Item.
 - i. Only project specific items should be sent.
5. Transmittal Letter: Transmit samples, etc. with form that contains Architect's Job name and number, Specification Number, Product Name, Manufacturer name and Model number. On the form, record requests for data and deviations from requirements.
6. Contractors Action/Approval

Include General Contractor's certification stamp that information has been checked and complies with requirements before submitting to architect. General Contractor's action stamp must include Approved or Approved as Noted.

Information received without the contractor's stamp will be returned without any action taken by engineer or architect.

C. Submittal Schedule:

1. After developing the Contractor's Construction Schedule, prepare a schedule of submittals. Submit at or before date of the Pre-Construction Conference.
2. Coordinate with a list of Subcontracts, Schedule of Values, List of Products and the Contractor's Construction Schedule.
3. Prepare the schedule in order by Section number. Provide the following information:
 - a. Date for first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data or Samples).
 - d. Name of the Subcontractor.
 - e. Description of the Work covered.
 - f. Date for the Architect's final approval.

D. Shop Drawings:

Submit newly prepared information drawn to scale. Indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Do not use Shop Drawings without an appropriate final stamp indicating action taken.
7. After receiving approved digital Shop Drawings, General Contractor is responsible for printing and delivering 2 hard copies of the approved shop drawings to the Architect within 10 days. Submittals are not considered complete until 2 copies

have been received by the Architect. This may have a direct effect on pay requests or final payment.

ALL MANUFACTURED ITEMS THAT ARE STRUCTURAL IN NATURE SHALL BEAR THE SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF ALABAMA AND SUBMITTED FOR APPROVAL.

E. Product Data:

1. Collect Product Data into a single submittal for each element of construction. Mark each copy to show applicable choices and options. Where Product Data includes information on several products, mark copies to indicate applicable information.
2. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
3. Submittals:
 - a. Unless noncompliance with Contract Documents is observed, the submittal serves as the final submittal.
4. Distribution:
 - a. Furnish copies to Installers, Subcontractors, Suppliers and others required for performance of construction activities.
 - b. Do not use unmarked Product Data for construction.

F. Samples:

1. Submit samples as required/requested and for color/texture finish selections.
2. Include the following:
 - a. Specification Section number and reference.
 - b. Generic description of the Sample.
 - c. Sample source.
 - d. Product name or name of the Manufacturer.
 - e. Compliance with recognized standards.
3. Refer to other Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar characteristics.
 - a. Samples erected at site and not incorporated into the Work, or designated as the Owner's property, are the Contractor's property and shall be removed from the site.

G. Architect's Action:

1. Except for submittals for the record or information, where action and return are required, the Architect will review each submittal, mark to indicate action taken, and return. Compliance with contract documents and specified characteristics is the Contractor's responsibility.
2. Action Stamp

- a. The Architect will stamp each submittal with an action stamp. The Architect will mark the stamp appropriately to indicate the action taken.
- b. Architect's Action Stamp will read as follows:

Reviewed by Lathan Associates Architects, P.C.

Date

Approved for Design as Noted Subject to Contractor Verifying
Quantities and Dimensions

2.0 - PRODUCTS

Not applicable.

3.0 - EXECUTION

Not applicable.

END OF SECTION

ELECTRONIC SUBMITTAL REQUIREMENTS FOR
LATHAN ASSOCIATES ARCHITECTS, P.C.

1. Processing: General Contractor must review and approve shop drawings and submittals prior to submitting to Architect. Allow the Architect two (2) weeks for initial review. Allow more time if the Architect must delay processing to permit coordination with other engineers and consultants.

NOTE: No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

2. Contractors Action / Approval

Include General Contractor's electronic certification stamp that information has been checked by the General Contractor and complies with requirements of the Contract Documents before submitting to architect. General Contractor's action stamp must include **Approved** or **Approved as Noted**.

Information received without the contractor's stamp will not be reviewed and no action will be taken by engineer or architect.

DIGITAL file name shall include Architect Job No, Specification Section number and description. (e.g., 15-01, 06100 - Rough Carpentry). We will not accept files that are randomly named. (e.g. scan 1234 or from Xerox Copier, etc.)

3. Submittal Preparation:

Include the following information on transmittal / email.

- a. Date
- b. Project Name and Architect's Project Number.
- c. Name of the General Contractor and Contact within company.
- e. Subcontractor/Supplier.

Clearly state **Number** and title of appropriate Specification Section and **Description** of Item and if applicable

- a. Name of the Manufacturer.
- b. Model / Style of Item.

4. **Electronic submittals will only be accepted when emailed to: submittals@lathanassociates.com**

DO NOT COPY ARCHITECTS OR ENGINEERS WITH THE SUBMITTAL

5. After receiving approved submittals, **General Contractor is responsible for printing and delivering 2 hard copies of the approved shop drawings to the Architect within 10 days.** Submittals are not considered complete until these copies are received by the Architect and may have a direct effect on Pay Requests and / or final payment.

I have read the above requirements and agree to the terms set forth in this document.

General Contractor

by: _____
Authorized Signature

Architect Job Name and Number

PRODUCT SUBSTITUTION PROCEDURES - SECTION 01360

1.0 GENERAL

1.1 Section Includes:

- A. General requirements for product options and substitution procedures.
- B. Material and product options.
- C. Substitutions.
- D. Coordination
- E. Substitution Request Form.

1.2 Related Sections:

- A. Section 01025 - Summary of Work
- B. Section 01040 - Project Coordination
- C. Section 01350 - Shop Drawing Submittals
- D. Section 01400 - Materials and Equipment
- E. Section 01900 - Warranties
- F. Section 01910 - Close Out Procedures
- G. In addition to "General Conditions of the Contract", comply with product option and substitution requirements specified in this Section.

1.3 Material and Product Options:

- A. Materials and products specified by reference standards, by performance, or by description only:
 - 1. Any product meeting specified requirements.
- B. Materials and products specified by naming products of one or more manufacturers with a provision for an equivalent product:
 - 1. Submit one of the products listed which complies with specified requirements or submit a Request for Substitution for a product of manufacturer not specifically named which complies with specified requirements.
- C. Materials and products specified by naming products of several manufacturers meeting specifications:
 - 1. Submit one of the products listed which complies with specified requirements or submit a Request for Substitution for a product of manufacturer not specifically named which complies with specified requirements.

1.4 Substitutions:

- A. After date of Notice to Proceed, Architect / Engineer will consider requests from Contractor for substitutions. Subsequently, substitutions will be considered only when a material or product becomes unavailable due to no fault of Contractor or as follows:
 - 1. Lockouts
 - 2. Strikes
 - 3. Bankruptcy
 - 4. Discontinuation of products
 - 5. Proven shortage
 - 6. Other similar occurrences
- B. Each proposed substitution of materials or products for that one specified is a representation by Contractor that he has personally investigated the substitution and determined that the proposed substitution is equivalent or superior to that specified in quality, durability and serviceability, design, appearance, function, finish, performance, and of size and weight which will permit installation in spaces provided and allow adequate service access. Additionally, Contractor agrees that it

will provide and/or do the following:

1. Same warranty on substitution as for specified product or materials;
 2. Coordinate installation and make other changes that may be required for Work to be complete in all respects;
 3. Waive claims for additional costs which may subsequently become apparent;
 4. Verify that proposed materials and products comply with applicable building codes and governing regulations and, where applicable, has approval of governing authorities having jurisdiction.
- C. The Architect/Engineer will review requests from Contractor for substitutions with the Owner. Contractor shall not purchase or install substitute materials and products without written approval. The Architect/Engineer will give written notice to Contractor and the Owner of acceptance or rejection within a reasonable time.
- D. Document each request for substitution with complete data substantiating compliance of proposed substitution with Contract Documents. Contractor shall use the *Substitution Request Form* along with appropriate attachments and submit them to the office of the Architect. A copy of the *Substitution Request Form* is included at the end of this Section.
1. Documents, as appropriate, shall include the following:
 - a. Reason for the proposed substitution;
 - b. Change in Contract Sum and Contract Time, if any;
 - c. Effect on work progress schedule and completion date;
 - d. Changes in details and construction of related work required due to substitution
 - e. Drawings and samples
 - f. Product identification and description
 - g. Performance and test data
 - h. Itemized comparison of the qualities of the proposed substitution to the product specified including durability, serviceability, design, appearance, function, finish, performance, size and space limitations, vibration, noise, and weight
 - i. Availability of maintenance service, source and interchangeability of parts or components
 - j. Additional information as requested.
- E. In the event of credit change in the cost, the Owner shall receive all benefit of the reduction in cost of the proposed substitution. Credit shall be established prior to final approval of the proposed substitution and will be adjusted by Change Order.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, without having been reviewed and approved by Contractor, or when acceptance will require substantial revision of Contract Documents without addition compensation to the Architect / Engineer.
- G. In the event that the Contractor or Subcontractor has neglected to place an order for specified materials and products to meet the work progress schedule, specified requirements, color schemes or other similar provisions, such failure or neglect shall not be considered as legitimate grounds for an extension of completion time nor shall arbitrary substitutions be considered to meet completion date.
- H. Only one request for substitutions will be considered for each product. When substitutions are not accepted, the Contractor shall provide specified product.
- I. Should substitution be accepted, and substitution subsequently is defective or

otherwise unsatisfactory, Contractor shall replace defective material or product with specified material or product at no cost to Owner.

1.5 Coordination:

- A. When a specified, optional, specified by reference standard, or proposed substitution item of equipment or material is submitted which requires minor changes or additions to the designed structure, finishes or to mechanical and/or electrical services due to its requirements being different from those shown on the Contract Documents, itemize the changes required and attach to submittal. Do not proceed with changes without written approval from the Architect / Engineer.
- B. Contractor shall make adjustments and changes required to coordinate Work for installation of optional materials and products, approved substitutions and materials and products specified by reference standards without additional costs to Owner or Architect/ Engineer.

2.0 PRODUCTS
Not applicable.

3.0 EXECUTION
Not applicable.

END OF SECTION

PRIOR APPROVAL / SUBSTITUTION REQUEST FORM

Date: _____

Company Submitting Request: _____
(Name and Address)

Contact Name: _____ Phone: _____ Fax: _____

E-Mail: _____

PROJECT NAME: _____

SPECIFIED ITEM: _____
(Section) (Page) (Description)

The undersigned requests consideration of the following product substitution:

PROPOSED SUBSTITUTION: _____
Provide Product Name / Model / Manufacturer

1. Attached data includes: _____ Product Description _____ Performance and Test Data
_____ Drawings _____ Specifications _____ Photographs
2. _____ Yes / No changes will be required to the Contract Documents for the proper installation of proposed product substitution. If yes, then attach data that includes description of changes.

The undersigned states that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on the drawings.
2. No changes to the building design, engineering design, or detailing are required by the proposed substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or **specified warranty requirements**.
4. No maintenance is required by the proposed substitution other than that required for originally specified product.

5. Other Information

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

Signature: _____ Printed Name: _____

Fax Number: _____

For Architect's Use:

_____ Accepted	_____ Accepted As Noted	_____ Incomplete Information
_____ Not Accepted	_____ Received Too Late	_____ No Substitutions Accepted For This Product

Reviewed By / Date: _____

Processed by Addendum No. _____

Comments: _____

1.0 - GENERAL REQUIREMENTS

1.1 Products and Materials

A. Products, materials and manufactured items or articles of like nature shall, as nearly as possible, be of one brand or manufacturer. No changes or substitutions shall be made without written consent of the Architect. In selection of colors and patterns, the Architect reserves the right to select from the manufacturer's running pattern line (within same price range) of the materials called for in the Specifications without the added cost to the Owner.

B. All products and materials used for this project shall be asbestos free.

1.2 Trade Names

The use of manufacturer's names and serial numbers are given to establish a standard of manufacture and not intended to be restrictive or preferential. Similar, equal, and approved materials of other manufacturers will be acceptable, subject to the approval of the Architect, pursuant to requirements set forth in INSTRUCTIONS TO BIDDERS and as required by the Specifications.

1.3 Measurements

Before ordering any material or doing any work, the Contractor shall verify all measurements of the building and shall be responsible for correctness of same. No extra charge or compensation will be allowed because of differences between actual measurements and the dimensions indicated on the Drawings. Any differences which may be found, shall be submitted to the Architect for consideration before proceeding with the work.

1.4 Salvageable Material

Any salvageable material and/or equipment shall remain the property of the Owner and, upon removal from its existing location, shall be stored where directed by the Architect.

In the event that the Owner does not wish to keep the salvaged material, it shall be the responsibility of the Contractor to remove same promptly from the site.

Salvageable material shall include those items indicated on the drawings as items to be reused or relocated. Remove all finish hardware from doors noted to be removed under demolition. Tag and label finish hardware as to door function (and label), and turn over to Owner.

Coordinate with Architect on questionable salvage items.

1.5 Unused Materials

Unused excess materials purchased for this project and charged against the contract shall be the property of the General Contractor and removed upon final completion.

END OF SECTION

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 required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections as well as specific quality-assurance and -control requirements for individual construction activities as referenced in the Sections that specify those activities.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
 - 2. Requirements for contractor to provide quality-assurance and quality-control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.

1.3 DEFINITIONS

- A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official and the Structural Engineer of Record.
- B. Construction Documents: Written (including specifications), graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.
- C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.
- D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.
- E. Special Inspection, Continuous: The full-time observation of work requiring special inspection by

an approved special inspector who is present in the area where the work is being performed.

- F. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- G. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
 - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
 - 2. Additional minimum qualifications of inspection and testing agencies and their personnel inspecting, and testing concrete and concrete related work shall be as follows:
 - a. An independent agency, acceptable to the Structural Engineer of Record qualified according to ASTM C 1077.
 - b. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - c. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
 - 3. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.
- C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.

- D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.6 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.
1. Special inspection reports and test results shall include, but not be limited to, the following:
 - a. Date of inspection.
 - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
 - c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.
 - 1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
 - d. Name and signature of special inspector and / or testing agency representative performing the work.
 - e. Additional information as required herein.
- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.
- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.
- D. Concrete Test Reports: Test results shall be reported in writing to Architect, Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain:
1. Project identification name and number.
 2. Date and time of concrete placement.
 3. Mix design number or identification.
 4. Design compressive strength at 28 days.
 5. Design Air Content.
 6. Design Slump.
 7. Location of concrete batch in Work.
 8. Time concrete was batched.
 9. Amount of water withheld at plant.
 10. Amount of water added at site.
 11. Temperature of mix at point of placement.
 12. Slump at point of placement

- a. When use of a Type I or II plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C494 is used, slump shall be measured and report both before addition of the admixture and at the point of placement.
- 13. Air content.
- 14. Name of concrete testing and inspecting agency.
 - a. Name of Laboratory Technician and ACI Certification Number.
 - b. Name of Field Technician and ACI Certification Number.
- 15. Compressive breaking strength.
- 16. Type of break.
- E. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITY

- A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.
- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.
- C. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
 - a. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
 - b. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
 - c. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.
- D. The contractor shall be responsible for costs of:
 - a. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
 - b. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
 - c. Repair or replacement of work that does not meet the requirements of the construction documents.

3.2 STRUCTURAL OBSERVATIONS

- A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.3 TESTING AND INSPECTION

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections,

as listed elsewhere in the project documents, and as listed herein.

B. Inspection of Fabricator's QC procedures

1. Review the quality control procedures of the following fabricators for completeness and adequacy relative to the fabricator's scope of work: steel fabricator.
 - i. Exception: AISC Certified Steel Fabricators that submit a "Certificate of Compliance" at completion of their scope of work.

C. Soils, Periodic Inspection.

1. Verify bearing capacities of soils beneath footings is in accordance with the approved project soils report and earthwork specifications.
2. Verify assumed bearing capacities (As noted on the drawings, recommended by the geotechnical engineer, and specified in earthwork specifications.) and determine settlements of soils beneath footings and building pad.
3. 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.
 - i. As recommended in approved soils report and specified in earthwork specifications.

D. Concrete, Continuous Inspection

1. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - i. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd, but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - ii. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - i. Unit Weight is only required for lightweight concrete
6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimens at 7 days, one set of two specimens at 28 days, and hold one in reserve for later testing as

directed by the Structural Engineer of Record.

- i. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
7. Inspect bolts to be installed prior to and during placement of concrete.
8. Inspect concrete placement to verify operations are in accordance with project requirements.
 - i. Verify correct mix is used.

E. Concrete, Periodic Inspection

1. Floor flatness:
 - i. Measure floor and slab flatness and levelness according to ASTM E 1155 within **24** hours of finishing..
2. Inspect concrete formwork prior to concrete placement, except as noted. Verify that construction joints are properly keyed. Verify that slab recesses, if any, have been installed.
3. Inspect reinforcing steel prior to concrete placement, except as noted, 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.
4. Inspect all concrete curing operations and verify they are in accordance with project requirements.

F. Masonry, Periodic Inspection

1. At beginning of masonry construction:
 - i. Inspect proportions of site prepared mortar and grout.
 - ii. Inspect construction of mortar joints.
 - iii. Inspect reinforcement for correct size and spacing.
2. At beginning of masonry construction and every 1000 square feet of masonry thereafter
 - i. Inspect work for size and location of structural elements
 - ii. Inspect work for correct location and type of embeds and anchor bolts.
 - iii. Specified size, grade, and type of reinforcement.
3. Prior to grouting
 - i. Inspect masonry cells and cleanouts prior to placement of grout. Verify spaces are clear.
 - ii. Inspect any site prepared grout proportions.
 - iii. Inspect placement of reinforcement.

- iv. Inspect construction of mortar joints
- 4. Inspect protection of masonry during cold weather and hot weather.
 - i. During periods with temperatures below 40 degrees or above 90 degrees.
- 5. Verify compliance with all required inspection provisions of the construction documents and approved submittals.

G. Steel Construction, Periodic Inspection

- 1. Inspect high-strength bolts, nuts and washers:
 - i. Identify markings to conform to ASTM standards specified in the construction document.
 - ii. Inspect manufacturer's certificate of compliance.
- 2. Inspect high-strength bolting: Bearing-type connections.
- 3. Inspect and verify structural steel material:
 - i. Identification markings to conform to ASTM standards specified in the approved construction documents.
 - ii. Manufacturers' certified mill test reports.
- 4. Inspect and verify weld filler materials:
 - i. Identification markings to conform to AWS specification in the approved construction documents.
 - ii. Manufacturer's certificate of compliance required
- 5. Inspect welding: Structural Steel:
 - i. Single-pass fillet welds $\leq 5/16$

H. Inspect Hollow Core Panels

- 1. Inspect panel placement.
- 2. Inspect panel connection to structure.

I. Special Inspection for Wind Resistance, Periodic Inspection

- 1. Roof Cladding and Roof Framing Connections.
- 2. Wall Connections to Roof.
- 3. Diaphragms connections to framing.

- J. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 - SCHEDULES AND FORMS (ATTACHED)

Statement of Special Inspections

Project: *Addition and Renovations to Cafeteria at Salter Elementary School*

Location: *Talladega County, Alabama*

Owner: *Talladega county Board of Education*

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Weekly* or ☐ per attached schedule.

Prepared by:

(type or print name)

Signature

Date

Design Professional Seal

Owner's Authorization:

Building Official's Acceptance:

Signature

Date

Signature

Date

Final Report of Special Inspections

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(Type or print name)

Signature

Date

Licensed Professional Seal

Agent's Final Report

Project:

Agent:

Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature

Date

*Licensed Professional Seal or
Certification*

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

Signature

Date

Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual

1.0 - GENERAL

1.1 Related Documents

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division - 1 Specifications Sections, apply to work of this Section. See drawings for additional Demolition and Protection Requirements not stated herein.

1.2 Description of Work

- A. Extent of selective demolition work as indicated on drawings and/or as required for completion of finish work.
- B. Types of Selective Demolition Work: Demolition requires the selective removal and subsequent offsite disposal of the following:
 - 1. It is the intent for all required existing building components, systems, related structure, materials, etc., be removed and/or relocated to allow for completion of new construction, whether indicated or not.
 - 2. All abandoned components, systems and related wiring, piping, ductwork, controls, fixtures, etc., shall be removed from job site, whether specifically indicated or not. Refer to Civil, Structural, Plumbing, Mechanical and Electrical drawings and specifications for respective demolition requirements and coordinate with Architectural.
 - 3. See drawings for other demolition items.

1.3 Submittals

- A. Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.
- B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
- C. Existing building function and operation shall be maintained during construction unless scheduled and approved by the Owner. Work schedule shall vary as required to complete work as required.
- D. Existing facilities shall be maintained in operation during construction. Protect and/or relocate all utilities, service, security systems, satellite communications, data systems, etc., as required to ensure continuous operation and function. Temporary relocation and utility outages shall be scheduled and approved by the Owner.

1.4 Job Conditions

- A. Owner will be continuously occupying areas of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.
- B. Owner and Architect assume no responsibility for actual condition of items or structures to be demolished.

- C. All salvageable materials, as selected by Owner, shall be removed, stored, and / or delivered to Owner as directed. Salvageable materials shall be protected during removal and delivery. All items of salvage not wanted by the Owner shall be the property of the General Contractor and removed from job site.
- D. Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.
 - 1. All paths to and from exits and entrances shall be maintained during construction. Provide temporary barricades, fences, warning signs, etc., as required, interior and exterior, to protect building occupants and pedestrians during construction and demolition.
 - 2. Erect temporary covered passageways as required by authorities having jurisdiction.
 - 3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
 - 4. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
 - 5. Protect floors with suitable coverings when necessary.
 - 6. Construct temporary insulated solid dust proof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.
 - 7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 - 8. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.
- F. Traffic:
 - 1. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.
 - 2. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- G. Explosives: Use of explosives will not be permitted.
- H. Utility Services:
 - 1. Maintain existing utilities indicated to remain, keep in service and protect against damage during demolition operations.
 - 2. Do not interrupt existing utilities or fire alarm/fire protection systems 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. Repair damages to such immediately.

- I. Environmental Controls:
 1. Use water sprinkling, temporary enclosures and other suitable methods to limit dust and dirt, interior and exterior, from rising and scattering in air to lowest practical level. **COMPLY WITH GOVERNING REGULATIONS PERTAINING TO ENVIRONMENTAL PROTECTION.**
 2. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.

2.0 - PRODUCTS

Products are not applicable to this section.

3.0 - EXECUTION

3.1 Inspection

Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions of structure surfaces, equipment or of surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's representative prior to starting work.

3.2 Preparation

- A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.
- B. Cease operations and notify the Owner's representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- C. Cover, protect, and relocate furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- D. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.
- E. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.
- F. Provide weatherproof closures for exterior openings resulting from demolition work.
- G. Locate, identify, stub off and disconnect utility services that are not indicated to remain.
- H. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change over.

3.3 Demolition

- A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete and masonry in all sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, roofs or framing.
 3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
 4. For interior slab on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
 5. Existing ceramic tile floor finishes shall be removed down to the top of the existing dropped slab.
- B. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect, rearrange selective demolition schedule as necessary to continue overall job progress without delay.
- 3.4 Disposal of Demolished Materials
- A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site. Pay all related fees and costs.
 - B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution.
 - C. Burning of removed materials is not permitted on project site.
- 3.5 Clean-Up and Repair
- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.
 - B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

1.0 - GENERAL

1.1 Scope of Work

- A. Demolition shall, unless otherwise noted, included removal of existing objects or improvements, whether indicated or not, that would in any way prevent or interfere with progress or completion of proposed.
- B. Permits, fees and licenses shall be secured and paid for by Contractor, including disposal charges as required to ensure progress of work will proceed.
- C. Work shall comply with the latest edition of city ordinance or regulations and/or requirements of any governing authorities or utility owners in demolition of existing pavement, curbs and gutters, drainage structures and utilities as may be required.
- D. Demolition requires removal and disposal off-site in a legal manner of all debris.

1.2 Job Conditions

- A. Occupancy: Areas to be demolished will remain in use for duration of work.
- B. Condition of Structures:
 - 1. Owner assumes no responsibility for actual condition of materials to be demolished.
 - 2. Conditions existing at time of the inspection for bidding purposes will be maintained by Owner insofar as practicable. Variations within structures may occur by Owner's removal and salvage prior to start of demolition work.
- C. Partial Removal:
 - 1. Items of salvageable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.
 - 2. Storage or sale of removed items on site will not be permitted.
- D. Protections:
Ensure safe passage of persons around areas of demolition. Conduct operations to prevent damage to adjacent buildings, structures, other facilities and injury to persons.
- E. Damages:
Promptly repair damages caused to adjacent facilities, etc., by demolition operations at no cost to Owner.

2.0 PRODUCTS (Not Applicable)

3.0 - EXECUTION

3.1 Demolition

- A. Pollution Controls
 - 1. Use suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - 2. Clean adjacent areas and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3. Protect all items remaining within building as required and clean all areas prior to final inspection.
- B. Scaffolding, Barricades, Shoring, etc.
Scaffolding, barricades, shoring, etc. as required shall be provided by the Contractor in compliance with all recognized safety rules and prevailing laws, codes or ordinances applicable thereto. All such scaffolding, barricades, shoring, etc., shall remain until construction has been completed. The Contractor, upon completion, shall remove any and all scaffolding, barricades, shoring, etc., and leave site clean from debris and make ready for other construction or use.
- C. Protection
 1. Existing walks, curbs, drives, other improvements on or near the site that are to remain, shall be properly protected from damage of any kind by the Contractor during the entire construction operation. Improvements that are damaged shall be replaced to the satisfaction of the Architect at the Contractor's expense.
 2. Provide all required protection as may be required by the governing governmental agencies for protection of the public on or near the site.
- 3.2 Disposal of Demolished Materials
 - A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site. Pay all related fees and costs.
 - B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution.
- 3.3 Payment
Include all work in this section in lump sum.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work required under this Section consists of providing all labor, materials and equipment necessary to do all clean-up work; including, but not limited to, periodic cleaning, removal of temporary protection, removal of debris and final cleaning.
- 1.2 Related Sections
Administrative provisions and technical requirements specified under this Section are in addition to provisions for cleaning specified under various Sections of the Specifications and apply to each Section of Specifications.
- 1.3 Special Instructions
 - A. Contractor shall endeavor to keep interior free of dust and mud, take precautionary measures, and provide protective materials, such as insulated dust and noise partitions and gravel at all entries during dried-in stages of construction.
 - B. Upon completion of work in each area or part of the building and immediately prior to final inspection and acceptance of that respective area, that area shall be thoroughly cleaned and made ready for immediate occupancy by the Owner.
 - C. In case of failure to comply with the requirements of this Section for any part of the work within the time specified by the Architect, the Architect may cause the work to be done and deduct the price thereof from the Contract Price on the next succeeding monthly Application for Payment.

2.0 - PRODUCTS

- 2.1 Equipment
 - A. For periodic and final cleaning operations, use approved apparatus designed for the specific type of cleaning required and compatible with the particular materials to be cleaned.
 - B. Operate equipment in compliance with equipment manufacturer's instructions.
- 2.2 Materials
All soap, detergents, brushes, scrapers and other materials and accessories utilized in periodic and final cleaning shall be of a type recommended by the material manufacturer as being compatible with and non-injurious to the particular surface, material, equipment or finish to be cleaned.

3.0 - EXECUTION

- 3.1 Periodic Cleaning
 - A. The Contractor shall periodically, or as directed during the progress of the work, clean-up and remove from the premises all refuse, rubbish, scrap materials and debris caused by his employees, his Subcontractors or resulting from his work.
 - B. Such clean-up shall be sufficient to assure that at all times the premises are sanitary, safe, reasonably clean, orderly and workmanlike.
 - C. Remove oily rags and combustible waste, debris, rubbish and excess materials from the premises at the completion of each day's work, or more often, if required to keep the building and premises free from any accumulation of flammable and dangerous materials.

- D. At no time shall any rubbish, debris or any other material be thrown from window or door openings nor into foundation trenches.
- E. Clean areas prior to any painting work. Take care to settle and minimize dust before painting begins. Use commercial type vacuum cleaners.
- F. Close rooms and areas where painting and decorating work is completed to all but authorized personnel.
- G. All debris and waste materials shall become the property of the Contractor and shall be removed by him from the project site.
- H. Remove Debris from roof tops daily.
- I. Trim excess exposed cur-o-wall flush with face of CMU.
- J. Keep adjacent paved driveways and roads clear of mud and debris intruded as a result of this work.

3.2 Removal of Temporary Facilities

- A. Upon completion of work in each area or part of the building, remove temporary lighting, power, protection and enclosures and repair defects in materials and workmanship noted after removal of such.
- B. Before final completion and final acceptance, the Contractor shall remove from the Owner's property, and from all public and private property, all tools, scaffolding, falsework, temporary structures and/or utilities including the foundations thereof (except as the Owner permits in writing to remain).

3.3 Final Cleaning

- A. Before final completion and acceptance, the Contractor shall remove from the Owner's property, and from all public and private property, all refuse, rubbish, scrap and surplus material and debris caused by his employees, his Subcontractors, or resulting from his work, leaving the site clean and true to line and grade, and the work in a safe and clean condition, ready for use and operation.
- B. Clean all painted, enameled, stained or baked enamel work to remove all marks, stains, smudges, fingerprints and splatters from such surfaces.
- C. Clean and remove all stickers, labels, marks, stains, smudges and paint from all glass. Wash and polish all glass, including, but not limited to, that in mirrors, view windows and doors, on the interior and exterior. Scratched or marred glass shall be replaced.
- D. Clean all hardware and metals to remove all stains, marks, smudges, fingerprints, dirt, dust, paint or other disfigurement and polish. Scratched, marred or otherwise disfigured hardware or metals shall be replaced.
- E. Clean all tile and floor finishes of all kinds to remove all splatters, stains, paint, dirt and dust. Wash and apply a final coat of wax and polish all finished floors except concrete and carpet as recommended by the manufacturer or as required by the Architect.
- F. Clean all manufactured articles, fixtures, materials, appliances and equipment to

remove all stickers, labels, rust stains and temporary covers.

- G. Clean and condition all manufactured articles, fixtures, materials, appliances and equipment and all electrical, heating and air conditioning equipment as recommended or directed by the manufacturer.
- H. Blow out or flush out all foreign matter from all dust pockets, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers and similar features of all appliances and equipment and all electrical, heating and air conditioning equipment as recommended or directed by the manufacturer.
- I. Remove all paint from all identification plates on all appliances and equipment and all electrical, heating and air conditioning equipment and polish plates.
- J. Exterior walks, steps, ramps and platforms shall be washed down and broom cleaned to remove all dirt, dust, stains or other disfigurements.
- K. Interior surfaces of all heating, ventilation and air conditioning ducts shall be damp or wet mopped or vacuum cleaned to remove all dirt and dust.
- L. In general, leave all work clean and free of dirt, dust, smudges, stains, paint spots, mastic, caulk, sealant and other excess materials.
- M. After final cleaning of building and prior to final balancing of heating and air conditioning system, all air filters shall be replaced with clean, new filters.
- N. Upon completion of final cleaning, remove all cleaning equipment, materials and debris from the building and the premises.

END OF SECTION

CHANGE ORDER PROCEDURES - SECTION 01800

1.0 - GENERAL

- A. This Section shall adhere to *General Conditions of the Contract, Article 19, and DCM Form C-12*, as issued by The State of Alabama Department of Construction Management, a copy of which is included within this Specification Manual.
- B. Should changes in the work constitute an increase or decrease in the Contract amount, the General Contractor shall submit a Change Order Request (COR) which shall include a number for identification, description and cost break down.
- C. Contractor shall attach all supporting documentation, including, but not limited to the following:
 - 1. Breakdown of costs which shall include material, labor, delivery (freight), installation, taxes, and mark-up for overhead and profit.
 - 2. If a Subcontractor is used for the requested change, then supporting documentation listed for Item 1 shall also be provided by the Subcontractor and included with the COR.
- D. In accordance with *General Conditions of the Contract, Article 19*, the General Contractor shall note the following:
 - 1. Mark-Up Procedures for Change Order with net addition to Contract:
 - a. The General Contractor's mark-up for overhead and profit shall not exceed fifteen (15) percent.
 - b. Where Subcontract work is involved, the total mark-up for the Contractor and Subcontractor shall not exceed twenty-five (25) percent.
 - c. The Architect must be able to determine the total amount of mark-up, therefore, supporting documentation **must** state the mark-up of both the Subcontractor and the General Contractor.
 - 2. Mark-Up Procedures for Change Order with net Credit to Contract:
"General Conditions of the Contract":
Changes which involve a net credit to the Owner shall include credits for overhead and profit on the deducted work of no less than 5%.
 - 3. Overhead "Indirect Costs": For the purposes of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change including but not limited to the following:
 - a. Bonds
 - b. Insurance
 - c. Superintendent
 - d. Job Office Personnel
 - e. Watchman
 - f. Job Office, office supplies and expenses
 - g. Temporary facilities and utilities
 - h. Home office expenses

2.0 - PRODUCTS (Not Applicable)

3.0 - EXECUTION

- A. General Contractor shall submit COR to Architect for review and approval. If approved, the Architect will submit to Owner for final approval. Upon approval by the Owner, the Architect will prepare required number of copies of Change Order DCM Form C-12 (local)

or DCM Form C-12 (PSCA) and forward to General Contractor.

- B. Six (6) copies of Change Order are required for locally funded projects and six (6) copies are required for PSCA funded projects. All copies must be signed by the General Contractor's Bonding Company with Power of Attorney attached.
- C. Sequence of execution shall be as follows:
 - 1. General Contractor signs all copies of Change Order. Note: Change Order must be signed by an Officer within the company.
 - 2. General Contractor forwards Change Order to their Bonding Company.
 - 3. Bonding Company signs each copy and returns same to G. C.
 - 4. G. C. forwards Change Order to Architect.
 - 5. Architect forwards Change Order to local Board of Education.
 - 6. Superintendent of local Board of Education executes and returns Change Order to Architect.
 - 7. Architect forwards Change Order to either the State Department of Education (local funded projects) or to The State of Alabama Department of Construction Management (PSCA funded projects).
 - 8. All parties will receive a copy of fully executed Change Order from the appropriate state agency for their permanent records.
- D. General Contractor may include cost of Change Order on Pay Application only after receipt of fully executed Change Order. This cost shall be included on Pay Application as a separate line item listing change order number and amount. Billing shall be for the percentage of work completed for the change order within the month covered by that Pay Application.
- E. All change(s) in the work shall require approval by the Owner, through the Architect, in advance of the commencement of any work associated with the change(s).
- F. Charges against Allowances shall **not** include General Contractor's mark-up.
- Refer to Specification Section 01020 - Allowances -
- G. Refer to "General Conditions of the Contract" - "DCM Form C-8 for additional information.

END OF SECTION

1.0 - GENERAL

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- C. Warranties
1. Subcontractors: General Contractor shall provide a one-year warranty from each Subcontractor they have under contract for the project.
 2. Vendors/Suppliers: General Contractor shall obtain a one-year warranty from each Vendor/Supplier for manufactured product used for the project. Example: *XYX Building Products, Inc.* shall provide a one-year warranty for each product they provided for the project, such as, *toilet partitions and hollow metal doors and frames*. This warranty may be on a form or letterhead provided by the Vendor/Supplier and must list all products provided for the project.
 3. Manufacturers: The Manufacturer's warranty for each product shall be placed directly behind the applicable Subcontractor or Vendor/Supplier's warranty within the warranty binder.
 4. Roof Warranties: The executed roofing warranties shall be presented at Final Inspection. Manufacturer's warranties cannot be prorated.
- D. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's and limitations on product warranties do not relieve suppliers, manufacturer's and subcontractors required to countersign special warranties with the Contractor.
- E. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- F. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- G. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.
- H. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise

available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 2. Where the Contract Documents require a special warranty, or similar commitment, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- I. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, submit written warranties upon request of the Architect.
1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- J. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- K. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper. Three (3) sets of warranties and close out documents are required: one set will be retained by the Architect and two sets will be delivered to the Owner.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

2.0 - PRODUCTS (Not Applicable)

3.0 - EXECUTION

The One-Year Warranty issued by the General Contractor shall list all disciplines they are covering when there is not a warranty from a Subcontractor. For instance, some General Contractors have Masons employed within their company and, therefore, do not contract Masonry work through a Masonry Subcontractor. In that case, the General Contractor's warranty would list Masonry as part of their itemized list of warranted work. Other typical examples are Painting, Rough Carpentry,

Miscellaneous Metals, etc.

Warranties shall bear the same date as the Date of Substantial Completion. All warranties shall be effective for a period of One Year from Date of Substantial Completion with exceptions for special warranties requiring extended periods of warranty coverage.

This list is designed as an aid to comply with close-out procedures; however, it should not be considered a complete and comprehensive list. General Contractor should review warranty requirements specified in Project Manual.

Warranties shall include, but not be limited, to the following:

Warranties from ALL Subcontractors for this project.

DIVISION 2 - SITE WORK

Site Protection
Soil Poisoning
Earthwork
Lawns and Planting
Hot-Mix Asphalt Paving
Site Concrete Walks, Curbs & Paving

DIVISION 3 - CONCRETE

Cast-In-Place Concrete
Structural Precast Concrete - Plant Cast
Architectural Precast Concrete

DIVISION 4 - MASONRY

04200 Unit Masonry

DIVISION 5 - METALS

05120 Structural Steel
05400 Cold-Formed Metal Framing
05500 Miscellaneous Metals
05800 Expansion Controls

DIVISION 6 - CARPENTRY

Rough Carpentry
Finish Carpentry

DIVISION 7 - MOISTURE PROTECTION

Solvent Type Dampproof Coating
Building Insulation
Preformed Metal Soffit
Thermoplastic Polyolefin (TPO) Roofing System
Sheet Metal Work Flashing and Trim
Roof Expansion Joint Tie-In System
Caulking and Sealants

NOTE: Provide roofing warranties as stipulated in Division 7 of the specifications, and as required by The State of Alabama Department of Construction Management. Roofing warranties shall be presented at the time of Final Inspection.

DIVISION 8 - WINDOWS AND DOORS

Hollow Metal Doors and Frames
Fire-Rated Aluminum Full Vision Doors and Frames
Flush Wood Doors
Rolling Service Doors
Door Hardware
Glass and Glazing

DIVISION 9 - FINISHES

Gypsum Drywall and Light Gauge Metal Stud System
Acoustical Panel Ceiling
Resilient Tile Flooring
Resilient Rubber Base and Accessories
Epoxy Resinous Flake Flooring
Paint

DIVISION 10 - SPECIALTIES

Identifying Devices
Roof Information Plaque

DIVISION 12 - FURNITURE AND FURNISHINGS

Fire Extinguishers
Miscellaneous Furnishing and Fixtures
Laminate Clad Casework

DIVISION 15 - MECHANICAL – HVAC

Mechanical Systems – Equipment – Labor

DIVISION 15 – PLUMBING and FIRE PROTECTION

Plumbing Systems – Fixtures - Labor

DIVISION 16 - ELECTRICAL

Electrical Systems – Fixtures -Equipment – Material and Labor

See attached WARRANTY FORMS immediately following for General Contractors and Subcontractors.

G. C.'S PROJECT NO. _____ ARCHITECT'S PROJECT NO: _____

GENERAL CONTRACTOR: _____ (Name and Address)

ARCHITECT: Lathan Associates Architects, P.C., 300 Chase Park South, Suite 200, Hoover, AL 35244

This is to certify that we, _____, the General Contractor for the above referenced project, per contract documents, warrant all labor, material and equipment provided and performed for a period of One (1) Year from the Date of Substantial Completion indicated above.

Dated this _____ day of _____

Sworn to and subscribed before me this

_____ day of _____

My Commission Expires: _____

SUBCONTRACTOR WARRANTY FORM

G. C.' S PROJECT NO. _____ ARCHITECT'S PROJECT NO: _____

PROJECT NAME: _____

GENERAL CONTRACTOR: _____

SUBCONTRACTOR: _____

(Name and Address)

PROJECT OWNER: _____

ARCHITECT: Lathan Associates Architects, P.C., 300 Chase Park South, Suite 200, Hoover, AL 35244

PROJECT SUBSTANTIAL COMPLETION DATE: _____

We, _____, Subcontractor for _____,
(name) (work)

as described in Specification Section(s) _____, do hereby warrant that all labor and materials provided and performed in conjunction with above referenced project are in accordance with the Contract Documents and will be free from defects due to defective materials and/or workmanship for a period of One (1) year from the Date of Substantial Completion indicated above or as required by the Specification Section relevant to your trade.

Should any defect develop during the warranty period due to improper materials and/or workmanship, the same, including adjacent work displaced, shall be made good by the undersigned at no expense to the Owner.

The Owner will give Subcontractor written notice of defective work. Should Subcontractor fail to correct defective work within Thirty (30) days after receiving notice, the Owner may, at his option, correct defects and charge Subcontractor cost for such correction. Subcontractor agrees to pay such charges upon demand.

Warranty applies to the following Work: _____

By: _____
(Name and Title)

Dated this _____ day of _____

1.0 - GENERAL

- A. Closeout requirements for specific construction activities are included in the appropriate Sections in Division 2 through 16.
- B. Final Inspection Procedures: See Section 01030 - Special Project Requirements for Inspection Requirements
 1. Deliver tools, spare parts, extra stock, and similar items.
 2. Changeover locks and transmit keys to the Owner.
 3. Complete startup testing of systems and instruction of operation and maintenance personnel. **Obtain signature(s) of all Owner's personnel participating in operation and maintenance instructions.**
 4. Remove temporary facilities, mockups, construction tools, and similar elements.
 5. Complete final cleanup requirements, including touchup painting.
 6. Touch up and repair and restore marred, exposed finishes.
- C. After Substantial Completion has been achieved, the General Contractor shall:
 1. Submit final payment request with releases and supporting documentation. Include insurance certificates where required.
 - a. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the Work claimed as substantially complete. Include supporting documentation for completion and an accounting of changes to the Contract Sum.
 - b. Advise the Owner of pending insurance changeover requirements.
 - c. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - d. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 - e. Deliver tools, spare parts, extra stock, and similar items.
 - f. Changeover locks and transmit keys to the Owner.
 - g. Complete startup testing of systems and instruction of operation and maintenance personnel. Obtain signature(s) of all Owner's personnel participating in operation and maintenance instructions.
 2. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
 3. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.
 4. Submit Consent of Surety to final payment.
 5. Submit Release of Liens.
 6. Submit a final settlement statement.
 7. Submit evidence of continuing insurance coverage complying with insurance requirements.
- D. Record Drawings: Maintain a set of prints of Contract Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark the drawing most capable of showing conditions fully and accurately. Give attention to concealed elements.
 1. Mark sets with red pencil.
 2. Mark completed record drawings: "As-Built" Set.
 3. Upon completion of the Work, submit record drawings to the Architect for the Owner's records in the form of two (2) CD's.

- E. Record Specifications: Maintain one copy of the Project Manual, including addenda. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications. Give attention to substitutions and selection of options and information on concealed construction. Note related record drawing information and Product Data. Mark cover of set: "As-Built".

Upon completion of the Work, submit record Specifications to the Architect for the Owner's records in the form of two (2) CD's.

Note: If space allows, both "As-Built" plans and specs may be scanned and saved onto a single CD and 2 copies of record CD's shall be submitted.

- F. Maintenance Manuals: Organize operation and maintenance data into sets of manageable size. Bind in individual, heavy-duty, 3-ring binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.

- G. Close-Out Documents

Close-Out Documents consists of the following:

1. General Contractor's Warranty
2. Subcontractors' Warranties
3. Manufacturers' Warranties
4. Affidavit of Advertisement of Completion
5. Consent of Surety to Final Payment
6. Contractor's Affidavit of Release of Liens
7. Operating and Maintenance Manuals / Instructions to Owner
8. "As-Built" Plans and Specification Manual
9. Owner's Set of Shop Drawing Submittals

General Contractor shall submit three (3) sets of binders for Items 1-7. Documents should be bound in 3-ring binders in size suitable for amount of material included. Divider tabs should be used to separate items.

If Operating Manuals are large, they can be bound in separate binders as indicated under Paragraph I listed above.

"As-Built" Plans and Specification Manual (2 set of each) should be complete and submitted on CD's. All plans should be submitted as one set. Do not submit separate sets of "As-Built" plans for Plumbing, HVAC, Electrical, etc.

Architect shall submit one copy of the Shop Drawings to the Owner with close-out documentation.

2.0 - PRODUCTS (Not Applicable)

3.0 - EXECUTION

- A. Operation and Maintenance Instructions:

Arrange for each Installer of equipment that requires maintenance to provide instruction in proper operation and maintenance. Include a detailed review of the following items.

1. Maintenance manuals.
2. Spare parts, tools, and materials.

3. Lubricants and fuels.
 4. Identification systems.
 5. Control sequences.
 6. Hazards.
 7. Warranties and bonds.
 8. Maintenance agreements and similar.
- B. As part of instruction for operating equipment, demonstrate the following:
1. Startup and shutdown.
 2. Emergency operations and safety procedures.
 3. Noise and vibration adjustments.
- C. Final Cleaning: Employ experienced cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Complete the following operations before requesting inspection for certification of Substantial Completion.
1. Remove labels that are not permanent labels.
 2. Clean transparent materials, including mirrors and glass. Remove glazing compounds. Replace chipped or broken glass.
 3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
 5. Clean the site of rubbish, litter, and foreign deposits. Rake grounds to a smooth, even textured surface.
- D. Pest Control: Engage a licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.
- E. Removal of Protection: Remove temporary protection and facilities.
- F. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Remove waste materials and dispose of lawfully.

END OF SECTION

1.0 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract including General and Supplementary Conditions and General Requirements apply to the work specified in this section.

1.2 DESCRIPTION

- A. This Work of this Section includes the protection and preservation from injury or defacement of all vegetation and objects designated to remain and the prevention of silts and increased run off leaving the site during or after site development.
- B. The Contractor is solely responsible for controlling runoff and siltation from the site and onto protected or undisturbed areas of the site or adjacent sites. Means and methods described herein are the minimum acceptable.
- C. The Work of this Section is incidental to the Contract and will not be paid for separately except where unit prices may be in effect.
- D. Related Sections: Divisions 2 Earthwork.

1.3 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. General:
 - a. Listings: Issues listed by references, including revisions of issuing authority, from part of this specification to extent indicated. Issues listed are identified by number, edition, date, title, or other designation established by issuing authority. Issues subsequently referred to are referred to by an issuing authority abbreviation and a basic designation.
 - b. Modification: Modifications to reference standards, if any, are noted with standard.
 - 2. Alabama Dept. of Transportation (ALDOT), Standard Specifications for Highway Construction, latest Edition: Section 665. Hay bales and Silt Fencing: Section 871, Fencing material.
 - 3. Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas, latest Edition.
 - 4. Local Codes, Ordinances, Regulations.
- B. Pre-Construction Meeting: Before proceeding with site operations, review site features to remain and be protected at the site with Owner and Architects.
- C. Tree Damage:
 - 1. If any trees to be saved are severely injured so as to cause a loss of natural character to the crown, or so as to impair the life support system

or to cause death as a result of construction operation, the Contractor agrees to pay fifty dollars (\$50.00) per one inch (1") of caliper, measured four feet (4') above the ground, for trees one inch (1") in caliper and larger, as fixed and liquidated damages, as determined by the Architects..

2. Severely damaged trees requiring liquidated damages will be determined by the Architects.
3. Damaged trees which are repairable as determined by the Architect shall be repaired by a qualified tree surgeon, approved by the Architect, and whose services will be at the Contractor's expense.
4. Clean up and repair damages to Owner's satisfaction.

D. Site Damage:

1. If any protection materials or measures are dismantled, removed or altered, even temporarily, or if areas of the site designated to remain are utilized in any manner without the Architects written authorization, the Contractor agrees to pay the Owner Five Hundred Dollars (\$500.00) per infraction, as determined by the Architect, as fixed and liquidated damages.

2.0 - PERFORMANCE REQUIREMENTS

2.1 PRODUCT/MATERIAL DESCRIPTION

A. Wattles and Silt Fencing:

1. In accordance with ALDOT Section 665.
2. Install at perimeter of clearing and grading operations where shown on Drawings (or as directed) as part of temporary erosion control and site protection.

3.0 - EXECUTION

3.1 JOB CONDITION

- A. It is intended that the part of the property on which new construction does not occur remain undisturbed and as is.
- B. Confine storage of materials, temporary facilities, and staging to areas approved by the Architect.
- C. Do not carry on construction operations or materials storage within five feet (5') of tree protection fencing or flagging for Limit of Clearing.

3.2 SEDIMENTATION AND EROSION CONTROL

- A. General: Employ erosion control management practices as required by the General Permit for Storm Water Discharges. The Contractor is responsible for obtaining any required erosion control permits for construction activity including all permit application fees. The Contractor will be responsible for application and maintenance of all conditions required by the permit. The Contractor is to be responsible for all requirements of the permit until acceptance of all work under this Contract.

- B. Control and abate water pollution and erosion at its potential source; employ downstream sediment entrapment measures as a backup to primary control at the source.
- C. Take all reasonable precautions to prevent and suppress fires and other detrimental occurrences which may be caused by construction operations.
- D. Protect streams, lakes and reservoirs and drainage systems from contamination by siltation or other harmful materials.
- E. The Contractor, his employees and subcontractors shall use conservation practices during the work, which shall include but are not limited to, the following:
 - 1. Comply with all federal, state and local laws, rules and regulations for prevention and suppressive action for forest fires.
 - 2. Protect and preserve soil and vegetation cover on the property and on adjacent lands. Any disturbance of soil and vegetation cover outside the Limit of Clearing line will not be permitted under any condition.
 - 3. Prevent and control soil erosion and gulleying within the property covered by Contract and the lands immediately adjacent thereto as a result of construction.
 - 4. Plan and conduct construction operations in such a manner so as to prevent pollution of streams, lakes and reservoirs with sediment or other harmful material used in the construction of the project. Protect downstream properties.
 - 5. Do not deposit waste, loose soil or other materials in live streams, swales or drainage ways.
 - 6. Do not allow fuels, oils, bitumen or other greasy or chemical substances originating from construction operations to enter or be placed where they may enter a live stream or drainageway.
 - 7. Coordinate sedimentation and erosion control measures with the clearing and grubbing operation so that both activities occur in the correct relation to one another.
 - 8. Install and maintain sedimentation and erosion control measures as a continuing program until the site work is complete. This includes, but is not limited to, repairs, any damage from storms, regular maintenance, and removal and disposal of accumulated silt.
- F. Wattles shall be anchored by use of stakes.
- G. Once installed, maintain silt fence until its capacity has been reached or erosion activity in the areas has been stabilized. When a silt fence has reached its capacity to function and need for a backup fence becomes evident, provide an additional line of silt fence. Repair of a damaged silt fence shall be accomplished by utilizing same type of materials used in original construction.
- H. Install and maintain sedimentation and erosion control measures as a continuing program until the site work is complete. This includes repairs, damage from storms, regular maintenance and removal and disposal of accumulated silt.

3.4 MAINTENANCE

- A. Maintain erosion control features that have been installed. Maintenance of erosion control features will be considered as an incidental part of the work and no specific payment for this will be made.

END OF SECTION 02125

1.0 - GENERAL

1.1 Scope

The work included under this section consists of furnishing all labor, material and equipment necessary to chemically treat the soil for termite control.

1.2 Applicator

The chemical shall be applied by an approved Pest Control Operator, bonded and licensed in the state in which the work is performed.

1.3 Guarantee

Upon completion of the soil treatment and as a condition for its final acceptance, the Pest Control Operator shall furnish to the Owner a written guarantee providing:

- A. The Pest Control Operator will furnish the Owner with a Repair and Retreatment policy which has annual inspections included within the cost of policy at no additional cost to the Owner as outlined in Items B-E below.
- B. That the chemical having at least the required concentration and the rate and method of application complies in every respect with the standards contained herein.
- C. That the Pest Control Operator guarantees the effectiveness of the soil treatment against termite infestation for a period of not less than five (5) years from date of treatment.
- D. Pest Control Operator will re-inspect at least once annually during protection period. Cost of Guarantee will include annual inspections for a period of five (5) years at no additional cost to Owner.
- E. Evidence of re-infestation within the five (5) year guarantee period will be retreated without cost to the Owner. Any damage caused by termite infestation during the five (5) year guarantee period will be repaired or replaced by the Pest Control Operator at no additional cost to the Owner.

2.0 - PRODUCTS

Provide chemicals in accordance with current laws and regulations. Notify Architect of any discrepancies.

2.1 Chemicals

BASF - Termidor (Fipronil)
Taurus SC - Control Solutions (Fipronil)
Bayer Environmental Science - Premise

2.2 Mixing of Chemicals

Shall be observed on site by the Contractor's Superintendent.

3.0 - EXECUTION

3.1 Application

- A. Basement or Crawl Space Construction (Minimum application)

1. Apply to critical areas along foundation walls, around piers and under suspended slabs and entrance platforms.
2. Apply at a rate of 1 gallon per 2-1/2 lineal feet per foot of depth along both sides of foundation walls, piers, etc.
3. Under suspended slabs and entrance platforms, apply overall treatment at rate of 1 gallon per 10 square feet.
4. Voids of unit masonry foundation walls and piers. Apply to voids at rate of 1 gallon per 5 lineal feet.

B. Slab-On Ground Construction (Minimum application)

1. Apply an over-all treatment under entire surface of floor slab including terraces and entrance platforms. Apply at rate of 1 gallon per 10 square feet, except that if fill under slab is gravel or other absorbent material, apply at rate of 1-1/2 gallons per 10 square feet.
2. Apply to critical areas along both sides of foundation wall expansion joints, around plumbing, utility services and other features that penetrate the slab at rate of 1 gallon per 2-1/2 lineal feet per foot of depth.
3. Voids of unit masonry foundation walls. Apply to voids at rate of 1 gallon per 5 lineal feet.

END OF SECTION

1.0 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Geotechnical Report by Terracon Consultants, Inc. Copies can be obtained from Terracon at (205) 942-2486.

1.2 SUMMARY

- A. This Section includes grading (excavating and filling) as indicated on drawings to required lines, dimensions, contours, and elevations for proposed improvements, and the following:
 - 1. Removal of existing improvements in conflict with proposed improvements.
 - 2. Stripping and stockpiling of topsoil. Remove any excess topsoil from the site upon final stabilization.
 - 3. Scarifying, moisture conditioning, compaction, and testing of previously graded areas to ensure proper preparation and acceptance.
 - 4. Excavation and embankment placement to required lines, grades, and elevations.
 - 5. Importing of off-site borrow material suitable for structural fill as well as exporting any excess material.
 - 6. Remove materials from grading operations that are determined unsuitable by the Geotechnical Engineer from site and dispose of off-site.
 - 7. Preparation of areas to receive fill and preparation of excavation areas.
 - 8. Undercutting and replacing soft, unsuitable material like "fat" clays, old fill, organic materials, etc. with compacted engineer fill obtained from an off-site source meeting the project specifications.
 - 9. Over-excavation of low consistency soils below footings and backfill with flowable fill or lean concrete.
 - 10. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 11. Excavating and backfilling trenches for buried utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 1 Section "Unit Prices" for a schedule of unit prices.
 - 2. Division 1 Section "Construction Facilities and Temporary Controls."

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:

Unsuitable soils and replacing with compacted structural fill: 200 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 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 to 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.

1.5 SUBMITTALS

- A. Submit per conditions of contract and Division 1.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548. (To be employed by the owner).

- B. Pre excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and/or the Engineer and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
 4. Existing utilities shown on the drawings are from a combination of field locations, and utility company records. It is the Contractor's responsibility to field verify existing utilities prior to excavation.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed or implied to be removed by new construction and not noted to remain. Coordinate with utility companies to shut off services if lines are active.
- C. Demolish and completely remove from site any buried remnant construction such as slabs, walls and foundations.
- D. Contours and existing topography shown on the drawings are believed to be reasonably correct. It shall be the Contractors responsibility to determine any discrepancies which would affect his work, to make allowance for such discrepancies in the contract sum and notify the Architect in writing of such discrepancies and allowances made.

2.0 - 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 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, GM, GC, SC, SW, SP, SM, MH, 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 passing a No. 200 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.

3.0 - 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 ground water 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

- 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 95 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

- 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 02300

1.0 - GENERAL

1.1 Scope

The work under this section consists of all finish grading, topsoil, lawns, seeding and sodding.

1.2 Extent of Lawn Area

A. The Lawn Area to receive top soil shall include the building site to the extent that will cover all unpaved areas disturbed by this construction. Blend new Lawn Area into areas of the site which are not covered under this Section.

B. Sod as indicated. Seed and straw all remaining areas disturbed by construction.

1.3 Time for Planting

When other portions of the work have progressed sufficiently the contractor may begin work for lawns and planting including the placing of topsoil. Operations shall be conducted under favorable weather conditions during the seasons which are normal for such work. Planting seasons generally shall be October 1 to March 1 for trees and plant materials, and April 1 to July 1 for planting permanent lawns.

1.4 Inspection for Acceptance

A. Inspection of the work of lawns and planting to determine the degree of completion of contract work, will be made by the architect at the conclusion of planting operations. Inspection of the work for final acceptance will be made at the end of the maintenance period.

B. After final inspection the Contractor will be notified of acceptance of all lawn and/or planting work, or if there are any deficiencies, of the requirements for completion of the work.

1.5 Guarantee and Replacement

The lawn shall be guaranteed for the duration of one full growing season after planting. The lawn shall be alive and in satisfactory growth at the end of the guarantee period.

2.0 - PRODUCTS

2.1 Materials

A. Fertilizer shall be 12-4-8 commercial fertilizer or equal and shall be uniform in composition, dry, and free-flowing. Fertilizer shall be delivered to the site in original unopened containers, each bearing the manufacturer's guaranteed analysis.

B. Lime shall be agricultural lime (Dolomite), or equal, containing not less than 85% of total carbonates, and shall be ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.

C. Soil additive shall be 1/4" diameter or less pine bark mulch "Planting Mix".

D. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life. Furnish hose and watering equipment as required.

2.2 Topsoil

Topsoil shall be a fertile, friable soil possessing physical and chemical characteristics typical of productive soils in the vicinity. Topsoil shall have an acidity range between pH 6.0 and pH 6.5 or shall be conditioned to fall within this range. Topsoil shall contain not less than 3%

organic matter as determined by loss on ignition of moisture-free samples dried at 100 degrees C. Topsoil shall be without admixture of subsoil and shall be clean and reasonably free from clay lumps, stones, stumps, roots or similar substances 2" or more in diameter, debris or other objects which might be a hindrance to planting operations or plant growth. A laboratory soils test to be provided by the contractor when requested.

2.3 Seed

- A. Seed for disturbed areas not indicated for sod shall be 100% hulled Bermuda or Fescue as per plans.
- B. Seed for temporary seeding shall be 100% Annual Rye Grass.
- C. At the contractor's option, areas to be seeded may be sprigged with approved Bermuda grass stolons at the rate of three (3) cubic yards per 1,000 sq. ft. of lawn. Spacing shall be maximum of 8" o.c. each way in rows.
- D. Seed shall meet the requirements of the Federal Seed Act. Seed mixtures shall be delivered in the original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity germination, and weed seed content.

2.4 Sod

Sod shall be Tifton 419 Bermuda grass. Each piece of sod shall have a dense stand of the specified grass and shall be strongly rooted and free of pernicious weeds. It shall be mowed to a height not to exceed 3" before lifting and shall be of uniform thickness with not over 1-1/2" nor less than 1" of soil.

3.0 - EXECUTION

3.1 Preparation of Subgrade

The subsoil shall be graded uniformly and lightly compacted so that it will be parallel to proposed finish grade. Stones over 2" in size, sticks and rubbish shall be removed. No heavy objects except lawn rollers shall be moved over the lawn areas after the subgrade has been prepared.

3.2 Finished Grading

After the subgrade soil has been prepared, 4" of topsoil shall be spread evenly and lightly compacted. Topsoil other than that stockpiled shall be provided under this Section. No topsoil shall be spread in a frozen or muddy condition. Commercial fertilizer and lime shall then be scarified with a tiller into the top 3" of topsoil at the rate of 10 lbs. per 1000 sq. ft.

- A. Areas to be seeded shall be brought to finished grade and smoothed.
- B. Areas to be sodded shall be brought to within the thickness of the sod of finish grade.
- C. Areas where the topsoil has not been removed shall be scarified, smoothed, and sticks, stones and rubbish shall be removed.

3.3 Sowing of Seed

Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable and of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical spreader at the rate of 5 lbs. of grass seed per 1000 sq. ft. of area, lightly raked and watered with a fine spray so as not to create runoff until thoroughly soaked. Fifty percent of the seed shall be sown in one direction, and the remainder at right angles to the first sowing. The method of seeding may be varied at the discretion of the contractor on his own responsibility to establish a smooth uniform turf.

3.4 Laying of Sod

Except as noted, the contractor shall lay sod in all lawn areas having a slope of 3 to 1 or steeper; a 6' diameter circle of sod around all lawn drain inlets; and where shown on the Drawings. Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Sod shall be laid so that no voids occur and tamped or rolled. Topsoil shall be brushed or raked over the sodded area, rolled with 200# roller and the sod thoroughly watered.

A. Sod on slopes 3 to 1 or steeper shall be held in place by wooden pegs driven through the sod into the soil until they are flush with the top of the sod.

B. Strip or spot sod shall be placed so that the surface of the compacted sod will be slightly below the surrounding surface soil.

3.5 Temporary Seeding

Temporary seeding shall be promptly provided should the project be completed at a time when permanent grass cannot be planted. Seeding shall be seeded at the rate of 5 lbs. to 1000 sq. ft. of area. The contractor shall be responsible for erosional damage during the period of temporary planting. The specified fertilizer shall not be used for the Rye Grass planting. Prior to planting permanent lawn, the lawn bed shall be prepared as specified, and the Rye Grass growth shall be scarified in such a manner as to incorporate it into the soil. Should the temporary lawn be planted, it shall be maintained by occasional mowing and necessary repairs to all eroded areas until the beginning of the specified season for constructing permanent lawns.

3.6 Mulching of Seeded Areas

All seeded or sprigged areas having a slope of 4 to 1 or greater shall be mulched with a spray mulch of an approved latex-type material. Other areas may be mulched with wheat straw at the contractor's option. Spray mulch of a latex-type material shall be applied by hydroject method at the rate of 75 gals. of concentrate mixed in 1000 gals. of water per acre (23 gals. per 1000 sq. ft.).

3.7 Clean-Up

Any soil, mulch or similar material which has been brought onto paved areas by hauling operations or otherwise shall be removed promptly keeping these areas clean at all times. Upon completion of the planting, all excess soil, stones and debris which has not previously been cleaned up shall be removed from the site or disposed of as directed.

3.8 Lawn Maintenance

Lawn shall be protected and maintained by watering, mowing and replanting as necessary for at least 30 days after approximately 60% germination is evident.

END OF SECTION

1.0 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt paving overlay.
 - 4. Asphalt surface treatments.
 - 5. Pavement-marking paint.
 - 6. Cold milling of existing hot-mix asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for aggregate base courses.

1.3 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. DOT: Department of Transportation.

1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT. Retain first subparagraph below if standard specifications are indicated on Drawings.
 - 1. Standard Specification: Alabama Department of Transportation (ALDOT) "Standard specifications for highway construction" latest edition.
 - 2. Measurement and payment provisions and safety program submittals included in the standard specifications do not apply to this Section.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: For each job mix proposed for the Work.
- C. Material Test Reports: For each paving material.
- D. Material Certificates: For each paving material, signed by manufacturers.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.
- C. Regulatory Requirements: Comply with "Standard Specifications for Highway Construction" latest edition of ALDOT for asphalt paving work.
- D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - 2. Review condition of subgrade and preparatory work.
 - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - 4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-

based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

2.0 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Course aggregate shall comply with ALDOT Section 801.
- C. Fine Aggregate: Fine aggregate shall comply with ALDOT Section 802.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: Mineral filter shall comply with ALDOT Section 805.

2.2 ASPHALT MATERIALS

- A. Base course: Place to width and depth shown and comply with ALDOT Section 825, Type B.
- B. Asphalt Binder: Bituminous concrete binder layer to width and depth shown on the drawings in accordance with ALDOT Section 424B.
- C. Prime Coat: Shall be in accordance with ALDOT Section 401.
- D. Tack Coat: Shall be in accordance with ALDOT Section 405.
- E. Surface Course: Shall be in accordance with ALDOT Section 424A.
- F. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wet-able powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Joint Sealant: ASTM D 3405, hot-applied, single-component, polymer-modified bituminous sealant.
- D. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N.
 - 1. Color: As indicated on the drawings.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes meeting the requirements of the applicable sections of the ALDOT "Standard Specifications for Highway Construction" and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: ALDOT 825, Type B.
3. Binder Course ALDOT 424B.
4. Surface Course: ALDOT 424A.

3.0 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Verify that subgrade elevation is as indicated on the drawings.
- C. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- D. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 1. Mill to a depth of 1-1/2 inches.
 2. Mill to a uniform finished surface free of gouges, grooves, and ridges.
 3. Control rate of milling to prevent tearing of existing asphalt course.
 4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 6. Transport milled hot-mix asphalt to asphalt recycling facility.
 7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
 1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of.
 - 1. Clean cracks and joints in existing hot-mix asphalt pavement.
 - 2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
 - 3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.
- C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.3 to 0.50 gal./sq. yd. Apply in accordance with ALDOT Section 401.03 (d) 4. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.

- D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Place hot-mix asphalt surface course in single lift.
 3. Spread mix at minimum temperature of 250 deg F.
 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
 - 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 15 days before starting first coat of pavement marking. Second coat shall be placed 30 – 60 days after the first coat.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply 2 coats of paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils per coat.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow excavated materials to accumulate on-site.

END OF SECTION 02741

SITE CONCRETE WALKS, CURBS & PAVING - SECTION 02751

1.0 – 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 exterior cement concrete for the following:
 - 1. Driveways and roadways.
 - 2. Parking lots.
 - 3. Curbs and gutters.
 - 4. Walkways.
 - 5. Site walls and footings.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or adhesive.
 - 8. Joint fillers.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
 - 1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required other construction activities.

2.0 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Epoxy-Coated Welded Wire Fabric: ASTM A 884, Class A, plain steel.
- D. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
- E. Epoxy-Coated Reinforcement Bars: ASTM A 775; with ASTM A 615, Grade 60, deformed bars.
- F. Steel Bar Mats: ASTM A 184; with ASTM A 615, Grade 60, deformed bars; assembled with clips.
- G. Plain Steel Wire: ASTM A 82, as drawn.
- H. Epoxy-Coated Wire: ASTM A 884, Class A coated, plain steel.
- I. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- J. Epoxy-Coated Joint Dowel Bars: ASTM A 775; with ASTM A 615, Grade 60, plain steel bars.
- K. Tie Bars: ASTM A 615, Grade 60, deformed.
- L. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- M. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.
- N. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.
 - 1. Fly Ash: ASTM C 618, Class F or C. Use one brand of cement throughout project unless otherwise accepted.
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Blended Hydraulic Cement: ASTM C 595M, Type IS, portland blast-furnace slag cement.
- D. Blended Hydraulic Cement: ASTM C 595M, Type IP portland pozzolan cement.
- E. Blended Hydraulic Cement: ASTM C 595M, Type I (PM) pozzolan-modified portland cement.
- F. Blended Hydraulic Cement: ASTM C 595M, Type I (SM) slag-modified portland cement.
- G. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4S.
 - 2. Class: 4M.
 - 3. Class: 1N.
 - 4. Maximum Aggregate Size: 1-1/2 inches nominal.
 - 5. Maximum Aggregate Size: 1 inch nominal.
 - 6. Maximum Aggregate Size: 3/4 inch nominal.
 - 7. Do not use fine or coarse aggregates containing substances that cause spalling.
- H. Water: ASTM C 94.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing Non-Chloride Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- G. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- B. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Color: As selected by Architect from manufacturer's full range.
- C. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.
 - 1. Color: As indicated.
- D. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- F. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.
- G. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.

2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- H. Chemical Surface Retarder: Water-soluble, liquid set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
- I. Colored Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.
1. Color: As selected by Architect from manufacturer's full range.

2.7 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 ACI 301 and ACI 318-89, Section 5.3, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
1. Compressive Strength (28 Days): 4000 psi for site walls and footings.
 2. Compressive Strength (28 Days): 3000 psi unless noted.
 3. Maximum Water-Cementitious Materials Ratio: 0.50 for site walls.
 4. Maximum Water-Cementitious Materials Ratio: 0.53 unless noted.
 5. Slump Limit: 3-5 inches.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 4. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
1. Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.
 2. Air Content: 6.0 percent for 1-inch maximum aggregate.
 3. Air Content: 6.0 percent for 3/4-inch maximum aggregate.
- F. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

- G. Coloring Agent: Add coloring agent to mix according to manufacturer's written instructions.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixers of capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

3.0 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
 - 1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 3. Provide tie bars at sides of pavement strips where indicated.
 - 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
 1. Radius: 1/4 inch.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if approved by Architect.
- I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- N. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.

- b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
- 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
 - 8. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 9. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for 30 days and be dry before starting first coat of pavement marking. Second coat shall be placed 30 – 60 days after the first.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply 2 coats of paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils per coat.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When total quantity of a given class of concrete is less than 50 cu. yd. Architect may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.11 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751

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 specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Concrete paving and walks are specified in Division 2.

1.3 SUBMITTALS:

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Submit all shop drawings on one reproducible print and two copies only. The reproducible print will be returned. All copies required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.
- C. Shop drawings for reinforcement, prepared for fabrication, bending, and placement of concrete reinforcement. Comply with ACI S-66 (88), "ACI Detailing Manual," showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.
- D. Samples: Submit samples of materials as requested by Architect, including names, sources, and descriptions.
- E. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.
- F. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.4 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. ACI 301 "Specifications for Structural Concrete for Buildings".
 - 2. ACI 302 "Guide for Concrete Floor and Slab Construction".
 - 3. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing

Concrete".

4. ACI 305 "Hot Weather Concreting".
 5. ACI 306 "Cold Weather Concreting".
 6. ACI 309 "Guide for Consolidation of Concrete"
 7. ACI 311 "Recommended Practice for Concrete Inspection".
 8. ACI 318, "Building Code Requirements for Reinforced Concrete."
 9. ACI 347 "Recommended Practice for Concrete Formwork".
 10. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
 11. American Welding Society, AWS D1.4 "Structural Welding Code- Reinforcing Steel".
- B. Concrete Testing Service: Employ, at Contractor's expense a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.
- C. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Forms for Textured Finish Concrete: Units of face design, size, arrangement, and configuration to match Architect's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- D. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to exposed surface.
1. Provide ties that, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Reinforcement: ASTM A 185, welded steel wire reinforcement.
- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
 - 3. For sand blasted or intentionally roughened concrete surfaces provide supports of stainless steel (CRSI, Class 2).
- E. Threaded Dowels: Continuous threaded high-strength steel bars equal to "Lasstud" by Richmond Screw Anchor Co., Inc. Provide inserts compatible with dowels, designed for ultimate pull-out force indicated on the drawings.
- F. Steel Shapes, Plates and Rods: Conform to ASTM A 36 "Specification for Structural Steel".
- G. Do not weld reinforcing steel unless specifically noted on drawings. If welding is shown, conform to latest revision of AWS D12.1, "Reinforcing Steel Welding Code of the American Welding Society". Perform all welding with certified welders qualified per AWS.

2.3 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Use one brand of cement throughout project unless otherwise acceptable to Architect.
- B. Fly Ash: ASTM C 618, Type C or Type F.
 - 1. Limit use of fly ash to not exceed 25 percent of cement content by weight.
- C. Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete.
 - 1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
 - 2. Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to Architect.
- D. Water: Drinkable.
- E. Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water-Reducing Admixture: ASTM C 494, Type A.

- H. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G.
- I. Water-Reducing, Non-Chloride Accelerating Admixture: ASTM C 494, Type E.
- J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

2.4 RELATED MATERIALS:

- A. Available Products and/or Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to those listed.
- B. Granular Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.
- C. Vapor Retarder: Provide vapor retarder cover over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:
 - 1. Polyethylene sheet not less than 8 mils thick.
- D. Nonslip Aggregate Finish: Provide fused aluminum oxide granules or crushed emery as abrasive aggregate for nonslip finish, with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rustproof, and nonglazing and is unaffected by freezing, moisture, and cleaning materials.
- E. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- F. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.
 - 3. Polyethylene-coated burlap.
- G. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
 - 1. Contractor to verify that product is compatible with other applied finishes.
- H. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.
- I. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from one inch thick to feathered edges.
- J. Bonding Compound: Polyvinyl acetate or acrylic base.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
 - a. Polyvinyl Acetate (Interior Only):
 - 1) "Superior Concrete Bonder," Dayton Superior Corp.
 - 2) "Euco Weld," Euclid Chemical Co.
 - 3) "Weld-Crete," Larsen Products Corp.

4) "Everweld," L&M Construction Chemicals, Inc.

b. Acrylic or Styrene Butadiene:

- 1) "Acrylic Bondcrete," The Burke Co.
- 2) "Strongbond," Conspec Marketing and Mfg. Co.
- 3) "Day-Chem Ad Bond," Dayton Superior Corp.
- 4) "SBR Latex," Euclid Chemical Co.
- 5) "Daraweld C," W.R. Grace & Co.
- 6) "Hornweld," A.C. Horn, Inc.
- 7) "Everbond," L & M Construction Chemicals, Inc.
- 8) "Acryl-Set," Master Builders Inc.
- 9) "Intralok," W.R. Meadows, Inc.
- 10) "Sonocrete," Sonneborn-Rexnord.
- 11) "Stonlock LB2," Stonhard, Inc.

K. 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. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

2.5 PROPORTIONING AND DESIGN OF MIXES:

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial mixtures or field experience methods as specified in ACI 318-95 Section 5.3. If trial mixtures 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. Trial mix designs and strength tests, made by qualified independent material laboratory, in accordance with ACI 318-95 Section 5.3 are required for all concrete designs for which a suitable experience record is not available.
- C. Mix design based on a record of past performance in accordance with ACI 318-95 Section 5.3, may be provided by qualified concrete supplier or precast concrete manufacturer for concrete designs. Mix design shall be certified by an independent testing laboratory.
- D. All concrete mix designs shall include the following information:
 1. Proportions of cement, fine and coarse aggregate and water.
 2. Water/cement ratio, design strength, slump and air content.
 3. Type of cement and aggregates.
 4. Type and dosage of all admixtures.
 5. Type, color and dosage of integral coloring compounds, where applicable.
 6. Special requirements for pumping.
 7. Any special characteristics of the mix which require precautions in the mixing, placing or finishing techniques to achieve the finished product specified.
- E. 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 proposed mix designs have been reviewed by Architect.

F. Design mixes to provide normal weight concrete as indicated on drawings and schedules.

G. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

2.6 ADMIXTURES:

A. Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.

1. Use high-range water-reducing admixture (HRWR) in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.

B. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).

C. Use air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having the total air content as shown on the drawings.

D. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.

E. Water-Cement Ratio: Provide concrete with the maximum water-cement (w/c) ratios as shown on the drawings.

F. Slump Limits: Proportion and design mixes to result in slump at point of placement as shown on the drawings.

2.7 CONCRETE MIXING:

A. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

B. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as specified.

1. Addition of water to batch for material with insufficient slump will be permitted in accordance with ACI 301.

2. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

C. High range water reducing admixture (superplasticizer) redosage may be permitted when prior approval, as to methods and procedures, is obtained from the Architect.

PART 3 - EXECUTION

3.1 GENERAL:

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.2 FORMS:

A. General: Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads.

Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 301 Table 4.3.1.

- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
- D. 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 tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. 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.
- F. 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.
- G. 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 before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.3 VAPOR RETARDER INSTALLATION:

- A. General: Following leveling and tamping of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour.
- B. Lap joints 6 inches and seal vapor retarder joints with manufacturers' recommended mastic and pressure-sensitive tape.
- C. After placement of vapor retarder, cover with sand cushion and compact to depth as shown on drawings.

3.4 PLACING REINFORCEMENT:

- A. General: 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.
 - 1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. 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 reinforcement in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 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.
- B. Provide keyways at least 1-1/2 inches deep in construction joints in walls, slabs, beams and between walls and footings.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. 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, foundation walls, grade beams, and elsewhere as indicated.
 - 1. Joint filler and sealant materials are specified in Division 7 Sections of these specifications.
- F. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth or approved inserts, unless otherwise indicated. Make saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregates.
 - 1. With prior approval from Architect contraction joints may be formed by inserting premolded plastic, hardboard, or fiberboard 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.
 - 2. If joint pattern not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).
 - 3. 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. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or 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 an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed. 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. 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.
- B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.
- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that 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 to avoid segregation at its final location.
- 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.
- E. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- F. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- G. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Architect.

3.9 FINISH OF FORMED SURFACES:

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

3.10 MONOLITHIC SLAB FINISHES:

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
 1. After placing slabs, plane surface to tolerances for floor flatness (Ff) of 15 and floor levelness (FI) of 13. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and as otherwise indicated.
 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, 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. Check and level surface plane to tolerances of Ff 18 - FI 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat

surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply 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, and with surface leveled to tolerances of Ff 20 - FI 17. Grind smooth surface defects that would telegraph through applied floor covering system.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
 2. After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose nonslip aggregate.
- F. Nonslip Aggregate Finish: Apply nonslip aggregate finish to concrete stair treads, platforms, ramps, sloped walks, and elsewhere as indicated.
1. After completion of float finishing and before starting trowel finish, uniformly spread 25 lbs. of dampened nonslip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as herein specified.
 2. After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose nonslip aggregate.
- G. Colored Wear-Resistant Finish: Provide colored wear-resistant finish to monolithic slab surface indicated.
1. Apply dry shake materials for colored wear-resistant finish at rate of 100 lbs. per 100 sq. ft., unless greater amount is recommended by material manufacturer.
 2. Cast a trial slab approximately 10 feet square to determine actual application rate, color, and finish, as acceptable to Architect.
 3. Immediately following first floating operation, uniformly distribute with mechanical spreader approximately 2/3 of required weight of dry shake material over concrete surface, and embed by means of power floating. Follow floating operation with second shake application, uniformly distributing remainder of dry shake material

with overlapping applications to ensure uniform color, and embed by power floating.
 4. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by dry shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.11 CONCRETE CURING AND PROTECTION:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.
- D. Provide moisture curing by following methods.
 1. Keep concrete surface continuously wet by covering with water.
 2. Use continuous water-fog spray.
 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with

water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

E. 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 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Provide curing and sealing compound to exposed interior slabs 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 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete. Architect to approve use where application of liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials are to be applied.

G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces, by application of appropriate curing method.

I. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

J. Sealer and Dustproofers: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.12 REMOVAL OF FORMS:

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

3.13 REUSE OF FORMS:

- A. Clean and repair surfaces of forms to be reused 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. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled.

3.15 CONCRETE SURFACE REPAIRS:

- A. General: No surface shall be patched or repaired until the Architect has reviewed the defective condition and approved the Contractor's submitted repair and/or patching materials and procedures.
- B. 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 inch 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 inch. 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 before 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.
- C. 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.
- D. 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 and smoothness by using a template having required slope.
 - 1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through nonreinforced 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 patching compound. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
 4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, when acceptable to Architect by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding 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.
- E. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method when acceptable to Architect. 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 before 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 72 hours.
- F. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.
- G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 END OF SECTION 03300.

STRUCTURAL PRECAST CONCRETE - PLANT CAST - SECTION 03410

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 structural precast concrete units, including the following:
 - 1. Hollow-core slab units.
- B. Related Sections: The following sections contain requirements that relate to this Section.
- C. Cast-in-place concrete is specified in Division 3 Section "Cast-in-Place Concrete."
- D. Joint sealants and backing are specified in Division 7 Section "Joint Sealants."
- E. Applied finishes are specified in Division 9 Sections.

1.3 SUBMITTALS:

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data and instructions for manufactured materials and products. Include manufacturer's certifications and laboratory test reports as required.
- C. Mix design reports of proposed concrete mix as specified in Part 2 of this Section.
- D. Shop drawings prepared by or under the supervision of a qualified professional engineer, showing complete information for fabrication and installation of precast concrete units. Indicate member dimensions and cross-section; location, size, and type of reinforcement, including special reinforcement; and lifting devices necessary for handling and erection.
 - 1. Indicate layout and dimensions, and identify each precast concrete unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at openings in precast units.
 - 2. Provide location and details of anchorage devices that are to be embedded in other construction. Furnish templates, if required, for accurate placement.
- E. Samples of bearing pads.
- F. Test reports as required by provisions of this Section.

1.4 QUALITY ASSURANCE:

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except as otherwise indicated:

1. ACI 301, "Specifications for Structural Concrete for Buildings."
 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 3. AWS D1.1, "Structural Welding Code: Steel."
 4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
 5. Prestressed Concrete Institute MNL 116, "Manual for Quality Control for Plants and Production of Precast Concrete Products."
- B. Fabricator Qualifications: Firm experienced in fabrication of precast concrete units similar to units required for this Project and that have a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in work.
1. Fabricator must be a producer member of the Prestressed Concrete Institute (PCI) and/or participate in its Plant Certification Program.
- C. Design by Fabricator: Design precast slab units to support superimposed dead loads including the weight of masonry partition walls, and live loads as indicated on drawings and as required for compliance with local governing code requirements.
- D. Fabrication Qualifications: Produce precast concrete units at fabricating plant engaged primarily in manufacturing of similar units, unless plant fabrication or delivery to Project site is impractical.
1. If units are not produced at precast concrete fabricating plant, maintain procedures and conditions for quality control that are equivalent to plant production.
- E. Fire-Resistance Rated Precast Units: Where precast concrete units are shown or scheduled as requiring fire-resistance classification, provide units tested and listed by Underwriters Laboratories, Inc. (UL) in "Fire Resistance Directory", or with each unit bearing UL label and marking.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver the amount of precast concrete units needed in a timely manner to the Project site to ensure installation continuity.
- B. Store and handle the units at the Project site to prevent cracking, distortion, staining, or other physical damage, and so that markings are visible. Lift and support units at designated lift points.
- C. Deliver anchorage items that are to be embedded in other construction before starting such work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 FORMWORK:

- A. Provide forms and, where required, form facing materials of metal, plastic, wood, or another acceptable material that is nonreactive with concrete and will produce required finish surfaces.

- B. Accurately construct forms, mortar-tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and for prestressed, pre-tensioning, and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL 116.
 - 1. Unless forms for plant-manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or movement during detensioning.
- C. Provide finish as directed by Architect's drawings for all exposed to view precast concrete beams and lintels. At a minimum the finish shall be rubbed smooth free of any pin holes and or honeycomb surfaces. Surface shall be of uniform color, texture and appearance. Provide all reveals in formwork as necessary to reproduce the visual lines shown on the architectural drawings. Do not attempt to tool or install reveals after beams have been cast.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Reinforcement: ASTM A185.
- D. Welded Deformed Steel Wire reinforcement: ASTM A 497.
- E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations.
 - 1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are protected with plastic (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.3 PRESTRESSING TENDONS:

- A. Uncoated, 7-wire, stress-relieved strand complying with ASTM A 416. Use Grade 250 unless Grade 270 is indicated.
 - 1. A strand similar to above but having the size and ultimate strength of wires increased so that the ultimate strength of the strand is increased approximately 15 percent, or a strand with increased strength but fewer number of wires per strand, may be used at manufacturer's option.

2.4 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C 150, Type I or Type III.
- B. Aggregates: ASTM C 33, and as specified here. Provide aggregates from a single source for exposed concrete.
 - 1. Local aggregates not complying with ASTM C 33, but that have shown by special test or actual service to produce concrete of adequate strength and durability, may be used when acceptable to Architect.

- C. Lightweight Aggregate: ASTM C 330.
- D. Water: Potable.
- E. Admixtures, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.
- F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- G. Water-Reducing Admixture: ASTM C 494, Type A, or other Type approved for fabricator's units.

2.5 CONNECTION MATERIALS:

- A. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A 283, Grade C.
- B. Steel Shapes: ASTM A 36.
- C. Anchor Bolts: ASTM A 307, low-carbon steel bolts, regular hexagon nuts, and carbon steel washers.
- D. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, and hardened washers complying with ASTM A 325.
- E. Finish of Steel Units: Exposed units galvanized per ASTM A 153; others painted with rust-inhibitive primer.
- F. Bearing Pads: Provide bearing pads for precast concrete units as indicated on drawings.
 - 1. Random oriented fiber reinforced material capable of supporting a compressive stress of 3000 psi with no cracking splitting or delamination.
- G. Welding Electrodes: Comply with AWS standards.
- H. Accessories: Provide clips, hangers, and other accessories required to install project units and to support subsequent construction or finishes.

2.6 GROUT MATERIALS:

- A. Cement Grout: Portland cement, ASTM C 150 (Type I), and clean, natural sand, ASTM C 404. Mix at ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- B. Metallic Shrinkage-Resistant Grout: Premixed, factory-packaged ferrous aggregate grouting compound complying with ASTM C 1107, Grade B, with fluid consistency and a 30-minute working time.
- C. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C 1107, Grade B, with fluid consistency and a 30-minute working time.
- D. Available Products: Subject to compliance with requirements, products that may be

incorporated in the Work include, but are not limited to, the following:

E. Products: Subject to compliance with requirements, provide one of the following:

1. Metallic Shrinkage-Resistant Grout:

- a. 100 Non-Shrink Grout (Metallic), Conspec, Inc.
- b. Firmix, Euclid Chemical Co.
- c. Vibra-Foil, W.R. Grace.
- d. Ferrogrout, L & M Construction Chemicals, Inc.
- e. Embeco 885, Master Builders.
- f. Portalico, Protex Industries, Inc.
- g. Kemox G, Sika Chemical.
- h. Ferrolith G, Sonneborn/Rexnord.

2. Nonmetallic Shrinkage-Resistant Grout:

- a. 100 Non-Shrink Grout (Non-Metallic), Conspec, Inc.
- b. Supreme Grout, Cormix, Inc.
- c. Sure Grip Grout, Dayton Superior.
- d. Euco N.S., Euclid Chemical Co.
- e. Crystex, L & M Construction Chemicals.
- f. Masterflow 928, Master Builders, inc.
- g. Sealtight 588 Grout, W.R. Meadows.
- h. Propak, Protex Industries, Inc.
- i. Set Non-Shrink, Set Products, Inc.
- j. Stoncrete NM1, Stonhard, Inc.
- k. Multi-Purpose Grout, Symons Corp.
- l. Portland Expanding Grout (Non-Shrink), Target Products, Ltd.
- m. Five Star Grout, U.S. Grout Corp.

2.7 MIX PROPORTION AND DESIGN:

- A. Prepare design mixes for each type of concrete required.
- B. Design mixes may be prepared by independent testing facility or by qualified precast manufacturing plant personnel at precast fabricator's option.
- C. Proportion mixes by either laboratory trial batch or field experience methods using materials to be employed on the Project for each type of concrete required complying with ACI 318.
 - 1. Produce standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
 - a. Compressive strength -- 5000 psi minimum at 28 days.
 - b. Release strength for prestressed units -- 3500 psi.
 - 2. Produce lightweight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
 - a. Compressive strength -- 5000 psi minimum at 28 days.
 - b. Air-dry density -- not less than 90 nor more than 115 lb per cu. ft.

- c. Release strength for prestressed units -- 3500 psi.
- 3. Cure compression test cylinders using same methods as for precast concrete work.
- D. Submit written reports to Architect of proposed mix for each type of concrete at least 15 days prior to start of precast unit production. Do not begin concrete production until mixes and evaluations have been reviewed by Architect.
- E. Adjusting Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Architect before using in the Work.
- F. Admixtures: Use air-entraining admixture in concrete, unless otherwise indicated.
 - 1. Use water-reducing admixtures in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.
 - 2. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

2.8 FABRICATION:

- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116 and as specified for types of units required.
- B. Job-Site Casting: Use ready-mix concrete for units produced at a location other than the precast concrete fabricating plant complying with ASTM C 94.
- C. Ready-Mixed Concrete: Comply with requirements of ASTM C 94 and as specified here.
 - 1. Delete references for allowing additional water to be added to the batch for material with insufficient slump. Adding water to the batch is not permitted.
- D. A shorter mixing time than that specified in ASTM C 94 may be required during hot weather or under conditions contributing to rapidly setting concrete.
 - 1. When the air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- E. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect the position of the main reinforcement or placing of concrete. Do not relocate bearing plates in units unless acceptable to Architect.
- F. Cast-in openings larger than 10 inches in diameter or 10 inches square in accordance with final shop drawings. Other smaller holes may be field cut by trades requiring them, as acceptable to Architect.
- G. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial formula form-coating compounds that will not bond with, stain, or

adversely affect concrete surfaces, and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.

- H. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
- I. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers and hangers, as required.
- J. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- K. Pre-tension tendons for prestressed concrete either by single-strand tensioning method or multiple-strand tensioning method. Comply with PCI MNL-116 requirements.
- L. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast units, complying with requirements of ACI 304. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items.
- M. Identify pick-up points and orientation in structure with permanent markings, complying with markings indicated on final shop drawings. Imprint casting date on each precast unit on a surface that will not show in the finished structure.
- N. Cure by low-pressure steam, steam vapor, radiant heat and moisture, or another similar process to accelerate concrete hardening and to reduce curing time.
- O. Delay detensioning prestressed concrete units until concrete has attained at least 70 percent of the design stress, as established by test cylinders.
 - 1. If concrete has been heat-cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 - 2. Detension pre-tensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- P. Finish formed surfaces of precast concrete as indicated for each type of unit, and as follows:
 - 1. Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, and form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.
 - 2. Commercial Finish: Remove fins and large protrusions and fill large holes. Rub or grind ragged edges. Faces are to be true, well-defined surfaces.
 - 3. Architecturally Exposed Finish: Provide finish as directed by architects drawings for all exposed to view precast concrete beams and lintels. At a minimum the finish shall be rubbed smooth free of any pin holes and or honeycomb surfaces. Surface shall be of uniform color, texture and appearance. Provide all reveals in formwork as

necessary to reproduce the visual lines shown on the architectural drawings. Do not attempt to tool or install reveals after beams have been cast unless approved by the architect.

- Q. Finish unformed surfaces by trowel unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.
 - 1. Apply scratch finish to precast concrete units that will receive concrete topping after installation. Following initial strikeoff, transversely scarify surface to provide ridges approximately 1/4 inch deep.

2.9 HOLLOW CORE SLAB UNITS:

- A. Type: Precast, prestressed concrete units with open voids running full length of slabs.
- B. Furnish units that are free of voids or honeycomb, with straight true edges and surfaces.
- C. Provide standard finish units unless otherwise indicated.
- D. Fabricate units of concrete materials that will provide a minimum 3500 psi compressive strength at the time of initial prestress and a 28-day compressive strength of 5000 psi.
- E. Adequately reinforce slab units to resist transportation and handling stresses.
- F. Include cast-in weld plates where required for anchorage or lateral bracing to structural steel members.
- G. Coordinate with other trades for installation of items to be cast-in hollow slab units.
- H. Provide solid, monolithic, precast slab units indicated to be an integral part of the hollow slab unit system. Design and fabricate solid units to dimensions and details indicated as specified for hollow slab units.
- I. Provide headers of cast-in-place concrete or structural steel shapes for openings larger than one slab width in accordance with hollow slab unit manufacturer's recommendations.

2.10 SOURCE QUALITY CONTROL:

- A. The Owner may employ an independent testing agency to evaluate precast manufacturer's quality control and testing methods.
- B. The precast manufacturer shall allow Owner's testing agency access to materials storage areas, concrete production equipment, and concrete placement and curing facilities. Cooperate with Owner's testing laboratory and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- C. Dimensional Tolerances: Units having dimensions smaller or greater than required and outside specified tolerance limits may be subject to additional testing as specified here.
- D. Precast units having dimensions greater than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to meet construction conditions.

- E. Strength of precast concrete units will be considered potentially deficient if the manufacturing processes fail to comply with any of the requirements that may affect the strength of the precast units, including the following conditions:
1. Failure to meet compressive strength tests requirements.
 2. Reinforcement, and pre-tensioning and detensioning tendons of prestressed concrete not conforming to specified fabrication requirements.
 3. Concrete curing, and protection of precast units against extremes in temperature not as specified.
 4. Precast units damaged during handling and erection.
- F. Testing Precast Units: When there is evidence that the strength of precast concrete units may not meet specification requirements, the Owner's testing laboratory will take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C 42 and as follows:
1. Take at least three representative cores from precast units of suspect strength, from locations directed by Architect.
 2. Test cores in a saturated-surface-dry condition per ACI 318 if concrete will be wet when using completed structure.
 3. Test cores in an air-dry condition per ACI 318 if concrete will be dry when using completed structure.
 4. Strength of concrete for each series of cores will be considered satisfactory if the average compressive strength is at least 85 percent of 28-day design compressive strength.
 5. Test results will be made in writing on the same day that tests are made, with copies to Architect, Contractor, and precast manufacturer. Include in the test reports the Project identification name and number, date, name of precast concrete manufacturer, name of concrete testing laboratory; identification letter, name, and type of member or members represented by core tests; design compressive strength, compressive breaking strength and type of break (corrected for length-diameter ratio), and direction of applied load to core with respect to horizontal plane of concrete as placed.
- G. Patching: Where core test results are satisfactory and precast concrete units are acceptable for use in Work, solidly fill core holes with patching mortar and finish to match adjacent concrete surfaces.
- H. Defective Work: Remove precast concrete units that do not conform to specified requirements, including strength, tolerances, and finishes. Replace with precast concrete units that meet requirements of this section.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

- A. Bearing Pads: Install flexible bearing pads where indicated as precast concrete units are being erected. Set pads on level, uniform bearing surfaces and maintain in correct position

until precast units are placed.

- B. Welding: Perform welding in compliance with AWS D1.1 and D1.4, including qualification of welders.
 - 1. Protect units from damage by field welding or cutting operations and provide non-combustible shield as required.
 - 2. Repair damaged metal surfaces by cleaning and applying a coat of galvanizing repair compound to galvanized surfaces and a compatible primer to painted surfaces.
- C. Powder-Actuated Fasteners: Do not use powder-actuated fasteners for attaching accessory items to the surface of a precast, prestressed unit unless otherwise accepted by precast manufacturer.
- D. Erection Tolerances: Install precast units without exceeding tolerance limits of PCI MNL-127, "Recommended Practice for Erection of Precast Concrete."
 - 1. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at connection and joints as follows:
 - a. Cement grout consisting of 1 part portland cement, 2-1/2 parts sand, and only enough water to properly mix and hydrate.
 - b. Shrinkage-resistant grout consisting of premixed compound and water to provide a flowable mixture without segregation or bleeding.
 - c. Provide forms or other acceptable method to retain grout in place until sufficiently hard to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

END OF SECTION 03410.

ARCHITECTURAL PRECAST CONCRETE - SECTION 03420

1.0 - GENERAL

1.1 Scope

- A. Furnish and install all Architectural Precast Concrete as indicated on the drawings and herein specified.

1.2 Submittals

- A. Submit shop drawings for approval.
- B. Shop drawings shall show fabrication details, layout plan, connection and anchorage details not indicated on the architect's drawings, and member identification marks. The identification marks shall appear on manufactured units to facilitate correct field placement.

1.3 Qualifications

- A. The concrete products covered by this specification and shown on the drawings shall be equal quality, strength, appearance, texture, design, shape and dimensions of that manufactured by Miller Precast Company, or pre-approved equal.
- B. Architectural Precast Concrete shall be reinforced, capable of supporting tensile loads and be manufactured according to standards of wet cast process. **Dry cast products (such as Cast Stone) shall not be acceptable.**
- C. The latest edition of the following specifications, standards and codes shall govern with modifications as specified herein:
 - 1. American Concrete Institute:
ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.
ACI 318 - Building Code Requirements for Reinforced Concrete.
ACI 347 - Recommended practice for Concrete Formwork.
 - 2. American Welding Society:
AWS D1.0 - Code for Welding in Building Construction.
AWS D3.0 - Standard Qualification Procedure.
AWS D12.1 - Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
 - 3. Industrial Fasteners Institute:
Handbook on Fastener Standards.

2.0 - PRODUCTS

2.1 Materials

Materials shall be as outlined in ACI 318 - Building Code Requirements for Reinforced Concrete and the AISC Manual of Steel Construction.

2.2 Design

- A. All concrete products shall be designed to support the dead and live loads in accordance with the International Building Code.
- B. Proposed design shall be supported by complete calculations and drawings and shall have the architect's approval.

- C. All reinforcing, connection, bearing and fitting details shown on the drawings indicate the intent. The concrete manufacturer shall be responsible for all detail connections and design thereof. Provide all materials required.

2.3 Finish

- A. Surface textures shall be with scored markings as selected by the Architect.
- B. All standard shaped concrete products shall be cast in steel, fiberglass, or concrete molds. Special shaped products may be cast in accurately constructed forms with smooth interior surfaces of plastic coated wood, Masonite or similar materials.
- C. Formed surfaces of concrete products shall be plant finish with an Architectural Grade a Finish. All air pockets and holes larger than 1/4" shall be filled with a sand-cement paste. All form offsets or fins shall be ground smooth.
- D. All surfaces of concrete shall be clean and uniform for acceptable exposed finish.

2.4 Fasteners

- A. The concrete manufacturer shall cast in structural inserts, bolts and plates as detailed on the contract drawings or required.
- B. Hand drilled, power drilled, and power driven inserts and studs may be placed in concrete members. Power driven inserts and studs shall be located a minimum of 4" from concrete edges to eliminate spalling.

3.0 - EXECUTION

3.1 Installation

- A. Concrete members shall be lifted and supported during manufacturing operations, stockpiling, transporting, and erection, only at the lifting and/or support points shown on the shop drawings.
- B. All concrete members shall be erected into final position in the structure by the concrete manufacturer or by other competent erection personnel.
- C. Erection shall be done with equipment, methods and personnel acceptable to the architect and manufacturer.
- D. Erection shall be defined as including placing and leveling the members in final position in the structure on bearing surfaces prepared true to the line and grade under other items of the general contract.
- E. Removal of lifting hook, if required.

END OF SECTION

1.0 - 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 unit masonry assemblies consisting of , but not limited to the following:
 - 1. Concrete Masonry Units
 - 2. Brick unit masonry
 - 3. Mortar and Grout
 - 4. Insulation in masonry walls
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Flashing and Sheet Metal" for exposed sheet-metal flashing installed in masonry
 - 2. Division 7 Section-07910 - "Joint Sealants" for sealing joint in mockup
 - 3. Division 7 - 07720 - Wall flashing
 - 4. Division 7 - Section 07180 -Dampproofing
 - 5. Division 8 - Section "FRP Doors"
 - 6. Division 8 - Section 08110 -Hollow Metal Doors and Frames
- C. Products installed but not furnished under this Section include the following:
 - 1. Hot dip-galvanized Steel lintels for unit masonry
 - 2. Wood nailers and blocking built into unit masonry
 - 3. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Flashing and Sheet Metal."

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 different masonry unit, accessory, and other manufactured product specified.
- C. Samples for initial selection of the following:
 - 1. Unit masonry samples in full size form showing the full range of colors and textures available for each different exposed masonry unit required.
- D. Samples for verification of the following:
 - 1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.

- a. Include size-variation data for Type FBS brick, verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances.
 - b. Weep holes/vents in color to match mortar color.
- 2. Accessories embedded in the masonry.
- E. List of Materials Used in Construction Mockups: List generic names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.
- F. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.
 - 1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 - 2. Each material and grade indicated for reinforcing bars.
 - 3. Each type and size of joint reinforcing.
 - 4. Each type and size of anchors, ties, and metal accessories.
- G. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
 - 1. Mortar complying with property requirements of ASTM C 270.
 - 2. Grout complying with property requirements of ASTM C 476.
 - 3. Masonry units complying with property requirements of ASTM C90.
- H. Qualification data for firms and persons specified in the "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.

1.4 Quality Assurance

- A. Clay Masonry Unit Test: For each clay masonry unit indicated, per ASTM C 67
- B. Concrete Masonry Unit Test: For each different concrete masonry unit indicated, per ASTM C 140
- C. Mortar Test: Test mortar properties per test methods of ASTM C 270
- D. Evaluate mortar composition and properties per ASTM C 780
- E. Grout Test: Test grout for compressive strength per ASTM C 1019
- F. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

- G. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.
- H. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- I. Mockup: Prior to installing unit masonry, construct sample wall panel(s) to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
 - 2. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect.
 - a. Include exterior face brick wall with field and accent brick and a control joint.
 - b. Seal control joint complying with Division 7 Section "Joint Sealants".
 - 3. Build mockups for the following types of masonry full thickness, including face and back-up wythes as well as accessories. Include a sealant-filled joint at least 16 inches long in each mockup.
 - a. Typical exterior face brick wall with through wall flashing installed for a 24 inch length in corner of mockup approximately 16" down from top of mockup with a 12 inch length of flashing left exposed to view (omit masonry above half of flashing).
 - b. Typical interior masonry unit wall.
 - c. Clean exposed faces of mockups with masonry cleaner "Sure Klean 600" or other masonry manufacturer approved cleaner.
 - d. Protect accepted mockups from the elements with weather-resistant membrane.
 - 4. Notify Architect one week in advance of the dates and times when mockups will be constructed.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
 - a. Acceptance of mockup is for color, texture and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship and other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
 - c. When directed, demolish and remove mockups from Project site.
 - d. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 Special Inspections

Cooperate and adhere to the requirements of 2015 International Building Code - Special Inspections. All masonry and masonry reinforcing shall be subject to special inspections and

observations, at stage intervals deemed necessary, by the Owners' third party Inspector, Engineer and/or the Architect prior to grout filling.

1.6 Special Markings

- A. The contractor shall chalk-line mark the floor slab for masonry wall locations.
- B. The contractor shall mark on the floor slab location of reinforcing dowels to serve grouted cells so as to be clear as to locations of vertical cell reinforcement.
- C. The contractor shall mark the concrete sub-floor with temporary marker paint to identify location of structural CMU reinforcing dowels so as to accurately locate reinforced cells during wall erection. Markings should be transferred to CMU surfaces as installation allows.
- D. Prefabricated Corner and "T" Wall Reinforcing - upon arrival to the job site and while material is in bundle state, the ends shall be spray painted in the field with permanent bright red paint for easy recognition during site inspections.

1.7 Special Sequencing

- A. After the special markings have been provided and prior to the start of CMU installation, an inspection of the concrete floor slab and CMU reinforcing dowels shall be required.
- B. CMU wall construction designed to receive structural reinforcement and cell grouting shall be installed in such sequencing as to consolidate the work of placing reinforcement and cell grouting to minimum concentrate intervals encompassing such significant quantities as to warrant truck delivery of ready-mixed grout.
- C. The work event of placing structural reinforcement and grouting shall require continuous special observation by the Owner's third party Inspector(s) as required by the 2015 International Building Code. Grout mix samples shall be required for testing purposes. The General Contractor shall directly schedule special masonry observations at least 24 hours in advance and notify Architect accordingly. Cost associated with special sequencing shall be considered and included in base bid.

1.8 Delivery, Storage, and Handling

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

1.9 Project Conditions

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:
 - a. 40 to 32 deg F : Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F
 2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
 - a. 40 to 25 deg F : Cover masonry with a weather-resistant membrane for 48 hours after construction.
 - b. 25 to 20 deg F: Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h.
 - c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.
 3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

2.0 - PRODUCTS

2.1 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Brick:
 - a. Acme Brick Co.
 - b. Belden Brick Co.
 - c. Cherokee Sanford Group, Inc.
 - d. US Brick
 - e. Boren
 - f. Triangle
 - g. Boral
 - h. Tri-State
 2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:
 - a. Essroc Materials, Inc.
 - b. Glen-Gery Corporation
 - c. Lafarge Corporation
 3. Joint Reinforcement, Ties, and Anchors:
 - a. Dur-O-Wal, Inc.
 - b. Heckman Building Products, Inc.
 - c. Hohmann & Barnard, Inc.
 - d. Wire-Bond

2.2 Concrete Masonry Units

- A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 2. Bullnose units are required for all outside corners of vertical surfaces, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,000 psi.
 2. Weight Classification: **NORMAL**
 3. Aggregates: Do not use aggregate made from pumice, scoria or tuff.
 4. Provide Type N-I moisture controlled units
 5. Size: Manufactured to the actual dimensions indicated on Drawings within tolerances specified in the applicable referenced ASTM specification. Typical unit 8" nominal, 6" nominal, 4" nominal, or 12" nominal as indicated on drawings.

2.3 Brick

- A. General: Provide shapes indicated and as follows for each form of brick required.

1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes and lintels.
 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: ASTM C 216 and as follows:
1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:
 - a. Grade: SW. With color through brick to match existing brick or as otherwise selected by the architect.
 2. Type: FBS. With color through brick as selected by the architect.
 3. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:
 - a. Standard: 3-5/8 inches thick by 2-1/4 inches high by 7-5/8 inches long.
 4. Application: Use where brick is exposed, unless otherwise indicated.
 5. Color and Texture: As selected by the architect to match existing adjacent brick.

2.4 Mortar and Grout Materials

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Masonry Cement: ASTM C 91
- C. Hydrated Lime: ASTM C 207, Type S (for CMU) Type N (for face brick).
- D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.
 1. White-Mortar Aggregates: Natural white sand and or ground white stone.
- F. Aggregate for Grout: ASTM C 404.
- G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- H. Cold Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C; and recommended by the manufacturer for use in masonry mortar of composition indicated.

- I. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.
- J. Water: Potable.
- K. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Cold Weather Admixture:
 - a. "Accelguard 80"; Euclid Chemical Co.
 - b. "Morset"; W. R. Grace & Co.
 - 2. Mortar shall be approved equal to Lafarge as selected by Architect from full range of mortar colors available to match existing mortar color.

2.5 Ties and Anchors, General

- A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated. Provide ties that will extend into the brick veneer a minimum of one half of the veneer width.
- B. Wire: As follows:
 - 1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for wire ties and anchors in exterior walls.
 - 2. Wire Diameter: 0.1875 inch.

2.6 Bent WireTies and Cornices

- A. Individual units prefabricated from bent wire to comply with requirements indicated below:
 - 1. Type for Masonry where Wythes are of Different Material: Adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches. Ties shall be long enough to extend through rigid wall insulation and into outer wythe a minimum of 2 inches.
- B. Joint Reinforcement: Provide 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" elsewhere.
 - 2. Ladder design with cross rods spaced not more than 16" o.c. One side rod for each face shell of concrete masonry back-up and one rod for brick wythe.
 - 3. Wire Size: 0.1875" diameter for deformed rods; No. 9 cross rods.
Hot dipped galvanized, Class 3. H. Reinforcing;
 - 4. Brick to block ties: 3/16" diameter adjustable double hook & eye; Hohmann & Barnard Lox-All Adjustable Eye-Wire, Dur-o-wall or equal.

2.7 Embedded Flashing Materials

- A. Vinyl Flashing:
 - 1. Thickness: 40 mil thick.

2. Application: Use where flashing is fully concealed in masonry
- B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.
- C. Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to the following:
 1. Vinyl Flashing:
 - a. Gibraltar
 - b. Nervastral
 - c. AFCO

2.8 Single-Wythe CMU Flashing

Single-Wythe Concrete Masonry Unit Drainage System: BlockFlash™

Install CMU cell flashing pans with built in adjoining bridge made from recycled polypropylene with chemical stabilizers that prevent UV degradation. Flashing pans have a sloped design to direct moisture to the integrated weep spout. Designed to be built into mortar bed joints to expel moisture (unimpeded by mortar droppings) to the exterior of CMU walls. Drainage Mats and Insect Guards included. Product: Subject to compliance with requirements, provide "BlockFlash™" as manufactured by Mortar Net Solutions.

2.9 Miscellaneous Masonry Accessories

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from Neoprene.
- B. Preformed Metal Control-Joints: Heckman 16 oz. copper – Type 93U, designed to fit brick size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep Holes: Provide the following:
 1. Wicking material; Cotton sash cord in length required to produce 2 inch exposure on exterior and 18 inches in cavity between wythes.
- E. Sealer for Brick: Prosoco-Siloxane-Weather Seal
- F. Rebar Positioners: 3/16" diameter, hot-dipped galvanized and provided at 48" vertical centers in each reinforced cell.

2.10 Wall Reinforcement and Anchors

- A. Continuous wall reinforcement at 16" o.c. for all masonry walls shall be hot-dipped galvanized and of either truss or ladder design with tabs for exterior two wyth walls. Reinforcement shall have not less than No. 9 steel wire cross rods and No. 9 deformed side rods. Wires shall conform to ASTM A82. Reinforcement shall have a drip when used in cavity walls, use rectangular pintle sections 16" o.c. in back-up masonry and adjustable double eyelet sections in face brick where rigid insulation is indicated or required in cavity space or where face brick and back-up masonry is not run up together. Use manufacturer's pre-formed corners and intersecting sections and splice as recommended. Basis of material selection shall be Hohmann & Barnard #270 or approved equals by Heckmann Building Products, Wire Bond and Dur-O-Wall.

2.11 Masonry Cleaners

- A. Job Mixed Detergent Solution: Solution of ½ cup dry measure tetrasodium polyphosphate and 1/2 cup dry measure laundry detergent dissolved in 1 gallon of water.
- B. Proprietary Detergent Solution: Manufacturere's standard strength cleaner designed for removing mortar/grout stains, efflorescence and othe new construction stains from new masonry surfaces as acceptable to masonry material manufacturer. "Sure Klean" No. 600 Detergent; ProSoCo, Inc., or approved equal. Do not use acid cleaners.

2.12 Mortar and Grout Mixes

- A. General: Do not add admixtures including coloring pigments, 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. Limit cementitious materials in mortar to portland cement-lime.
 - 2. Use Type S or N mortar.
- D. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
- E. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout to have minimum 2,500 psi compressive strength at 28 days when tested in accordance with ASTM C1019.
 - 1. Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
 - 2. Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

3.0 - EXECUTION

3.1 Examination

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

2. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 General

- A. Lay out all masonry work according to the dimensions shown on the drawings. No work shall be laid unless the temperature is 35° F. and rising.
- B. All masonry work shall be laid straight, level, plumb, and true. Exterior walls shall be laid continuously around the entire structure and in no case racked up more than five (5) feet.
- C. Build in all flashing, anchors, reinforcing, inserts, wall plugs, lintels, bearing plates, bond beams and items as required to accommodate the work of others.
- D. All special details such as chases, openings, expansion joints, projections, corbels, etc., shall be built as required and/or indicated on the drawings.
- E. Lay all masonry, brick and block in full bed of mortar completely filling all joints with mortar. Allow for caulking joints at all window and door frames, and at all wall intersections.
- F. Joints of all exposed masonry surfaces shall be finished after the mortar has taken its initial set. Use a straight edge for horizontal joints. Vertical joints shall be in alignment from top to bottom.
- G. At the end of each day or when rain or frost is imminent, the tops of masonry walls and similar surfaces shall be properly protected by covering top of wall with a strong waterproof membrane well secured in place.
- H. Consult all other trades in advance and make provisions for the installation of their work to avoid cutting and patching. Do all cutting and patching of masonry required to accommodate work of others.
- I. Unfinished work shall be stepped back to permit joining of new work. Masonry work may be toothed only when approved. Before connecting new work with work previously built, sweep clean, remove loose mortar and thoroughly wet the old brick.
- J. As the work progresses, mortar daubs and smears shall be cleaned from masonry work.
- K. Door frames shall be set before the masonry walls are built. As the masonry walls are built around these frames, the inside of the frames shall be grouted solid with mortar. NOTE: See HOLLOW METAL DOORS AND FRAMES - SECTION 08110 for requirements to coat interior of frames prior to grouting.
- L. Extend all rated walls to the underside of structural deck above unless otherwise approved. Fit walls neatly with all joints filled where two levels of ceiling occur, extend walls to high level. Extend all partition walls to 8" above adjacent ceiling.
- M. Weep holes: Provide weep holes in head joints 32" o.c. at thru wall flashing where air space is not open downward. Weep holes shall be below finish floor line and above finish grade.
- N. MORTAR IN CONTACT WITH COPPER PIPING WILL NOT BE ACCEPTED. Coordinate with plumbing or mechanical contractor if copper is encountered without sleeving/insulation. Anticipate additional corrective work.

3.3 Installation, General

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- F. Matching Existing Masonry: Match running bond coursing, color, and texture of existing brick masonry.
- G. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.4 Construction Tolerances

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet) or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch .
- E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.5 Laying Masonry Walls

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed CMU and Brick Masonry:
 - 1. Lay in running bond pattern to match and blend with existing.
- D. Lay concealed masonry with all units in a wythe as above. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.
- F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
- H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- J. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.6 Mortar Bedding and Jointing

- A. Lay hollow concrete masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed all webs in mortar.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
 - 4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.
 - 5. Fill bottom course of all CMU solid with mortar.
 - 6. Fill all courses of CMU adjacent to fill in area of ramp and stage solid with mortar.

- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.
 - 1. Lay all brick with full head and bed joints.
 - 2. At cavity walls, bevel beds away from cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.
 - 3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4 to 3/8 inch joints. Three brick courses and three mortar courses in 8 inch vertical to course with CMU.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- D. Cut joints flush for masonry walls that are to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.7 Structural Bonding of Multiwythe Masonry

- A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than 1 metal tie for 4 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown. Provide continuity with horizontal joint reinforcing at corners by using pre-fabricated "L" units as well as 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 by providing continuity with horizontal joint reinforcing at corners by using pre-fabricated "T" units.

3.8 Cavities

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
 - 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
 - 2. Tie exterior wythe to back-up with individual metal ties. Stagger alternate courses.

3.9 Anchoring Masonry to Structural Members

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Space weldable rebar couplers at horizontal bond beams as indicated, but not more than 24 inches o.c. vertically.

3.10 Cavity Wall and Masonry Cell Insulation

- A. On units of plastic board insulation, place small dabs of adhesive, spaced approximately 12 inches o.c. both ways on inside face or attach to inside face with plastic fasteners designed for this purpose. Verify compatibility of adhesive and bituminous dampproofing specified in Division 7. 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.
- B. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.11 Horizontal Joint Reinforcement

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches vertically o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement in mortar joints 1 block course above and below wall openings and extending 12 inches beyond opening.
 - a. Reinforcing above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

3.12 Control and Expansion Joints

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry by installing preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick made from clay or shale by forming an open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Maintain joint free and clear of mortar.

3.13 Lintels

- A. Install steel lintels where indicated.

- B. Provide pre-cast masonry lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.14 Flashing, Weep Holes, and Vents

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.
- C. Install flashing as follows:
 - 1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches unless otherwise indicated.
 - 2. At lintels and shelf angles extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
 - 3. Flashing installation is to be inspected and approved in writing by Architect before proceeding with masonry work.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
 - 1. Form weep holes with product specified in Part 2 of this Section.
 - 2. Form weep holes by keeping head joints free and clear of mortar.
 - 3. Space weep holes 24 inches o.c.
- E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
 - 1. Install through-wall flashing and weep holes above horizontal blocking.
- F. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.15 Grouting of CMU Walls

- A. Contractor to notify Owner's Testing Agent prior to all grouting of steel reinforced CMU.
- B. All cavities with steel reinforcing to be cleaned of all debris and broken CMU prior to filling with grout.
- C. All reinforcing steel in cells to be filled with grout or concrete to be continuous with laps as required by code.

- D. Grout for filled masonry cells is not to be dropped more than five (5) feet.

3.16 Repairing, Pointing and Cleaning

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 - 5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using approved masonry cleaner.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
- E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.17 Sealing of Brick

- A. Take precautions to avoid harm to building occupants, pedestrians, nearby property and all non-masonry surfaces from contact with sealer and fumes. Protect and/or divert auto and pedestrian traffic.
- B. Test masonry (minimum 4 ft x 4 ft area) before overall application to assure compatibility and desired water repellent results. (Treated and cured masonry should shed water and not wet out.) Apply tests using the same equipment as for job application and allow to cure 24 to 48 hours. Test panels should remain available for inspection by Architect.
- C. Surface Preparation:

1. Fill all cracks and voids to avoid penetration of fumes into the building. (Such openings may permit moisture, sealer or sealer fumes to penetrate wall.) Make sure that all caulks and sealants are in place and completely cured.
2. Clean dirt, oil and other contaminants from the surface. Use appropriate proprietary cleaners (do not use raw acids) where necessary. Rinse with pressure equipment at 500 to 1,500 psi to thoroughly remove all detergent residues. Do not apply to surfaces that are wet to the touch. Best results are obtained on dry surfaces. Internal moisture should also be dissipated.

3.18 Masonry Waste Disposal

- A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the project site.

END OF SECTION

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 fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
 - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
 - 2. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
 - 3. Refer to Division 3 for anchor bolt installation in concrete, Division 4 for anchor bolt installation in masonry.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Submit all shop drawings on three copies only unless specified otherwise in the general conditions. Two prints will be returned to the architect. All copies required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
- B. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards). This data is submitted for information only.
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. High-strength bolts (each type), including nuts and washers.
 - a. Include Direct Tension Indicators if used.
 - 3. Structural steel primer paint.
 - 4. Shrinkage-resistant grout.
- C. Shop drawings including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols 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 as work of other sections.

3. Contract documents shall not be used for shop drawing, including erection plans or details.
 4. All shop drawings which are resubmitted for any reason shall have all revised items clouded or identified for each submittal.
 5. All structural steel connections not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor.
- D. Test reports conducted on shop- and field-bolted and welded connections. Include data on type(s) of tests conducted and test results.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges", dated June 10, 1992.
 - a. General: AISC "Code of Standard Practice" shall apply except to the extent that references are made to the responsibility of the Owner and/or Architect or Engineer in which event those references shall have no applicability. Where a conflict exists between the Code of Standard Practice and the Contract Documents, the Contract Documents shall govern.
 2. AISC "Specifications for Structural Steel Buildings," including "Commentary".
 3. AISC "Specifications for Structural Steel Buildings, Section 10, Architecturally Exposed Structural Steel".
 4. "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections.
 5. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."
 6. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 2. If re-certification of welders is required, retesting will be Contractor's responsibility.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor rods 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 by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts become dry or rusty, clean and relubricate before use.

1. 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 that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.
- B. Structural Steel: ASTM A992, Grade 50 for wide flange beams; ASTM A36 elsewhere.
- C. Cold-Formed Steel Tubing: ASTM A500, Grade B.
- D. Hot-Formed Steel Tubing: ASTM A501.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.
- F. Moment Connection Material: Unless noted otherwise on the drawings, stiffener plates, doubler plates, gusset plates and the connecting plates shall be the same grade of steel as members being connected.
- G. Headed Stud-Type Shear Connectors: ASTM A108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.
- H. Anchor Rods: ASTM A307 Grade A, headed type with supplementary requirements S1, unless otherwise indicated.
- I. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts.
 1. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.
- J. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325.
 - a. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B695, Class 50, or hot-dip galvanized complying with ASTM A153.
 2. Quenched and tempered alloy steel bolts, nuts, and washers, complying with ASTM A490.
- K. Electrodes for Welding: Comply with AWS Code.
- L. Structural Steel Primer Paint: Red oxide primer.
- M. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.

- N. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.
1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
- a. 100 Non-Shrink Grout (Non-Metallic); Conspec, Inc.
 - b. Supreme Grout; Cormix, Inc.
 - c. Sure Grip Grout; Dayton Superior.
 - d. Euco N.S.; Euclid Chemical Co.
 - e. Crystex; L & M Construction Chemicals, Inc.
 - f. Masterflow 713; Master Builders.
 - g. Sealtight 588 Grout; W. R. Meadows.
 - h. Propak; Protex Industries, Inc.
 - i. Set Non-Shrink; Set Products, Inc.
 - j. Five Star Grout; U.S. Grout Corp.

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. Provide camber in structural members where indicated.
- 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
- 1. Bolt field connections, except where welded connections or other connections are indicated.
 - a. Provide high-strength threaded fasteners for all principal bolted connections, except where unfinished bolts are indicated.
- C. Simple Beam Connections: Standard double angle framed beam connections using bolts as specified.
- 1. Seated Beam Connections and Stiffened Seated Beam Connections shall not be used unless indicated on the drawings or unless Engineer approval is obtained to verify capacity of supporting member for the resulting eccentricity. The fabricator must verify and bear responsibility that the use of such connections does not interfere with Architectural or MEP requirements.
- D. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts."
- E. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

- 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 that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 - 1. Do not paint surfaces to be welded or high-strength bolted with slip-critical-type connections.
 - 2. Do not paint surfaces scheduled to receive sprayed-on fireproofing.
 - 3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- B. Painting: Provide a one-coat, shop-applied paint system complying with Steel Structures Painting Council (SSPC) Paint System Guide No. 7.00.

2.4 SOURCE QUALITY CONTROL

- A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 - 1. Promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
 - 1. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.1 ERECTION

- A. Surveys: Employ a licensed land surveyor for accurate erection of structural steel. 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. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - 4. For proprietary grout materials, comply with manufacturer's instructions.
- E. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- F. Level and plumb individual members of structure within specified AISC tolerances.
- G. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- H. Splice members only where indicated and accepted on shop drawings.
- I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces. Each erection bolt on shop drawings shall be noted "Erection Bolt".
 - 1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- K. 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 QUALITY CONTROL

- A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted

connections and welded connections and to perform tests and prepare test reports.

- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- F. Field Inspections and Tests:
 - 1. Check steel as received in the field for possible shipping damage workmanship, piece making and verification of required camber.
- G. Shop-Bolted Connections:
 - 1. Inspect or test in accordance with AISC specifications.
 - 2. For bolted connections (bearing-type), all connections shall be visually observed to assure that all bolts, nuts and washers are in place and that all plies of connection material have been drawn together. All bolts shall be verified to be snug tight only.
- H. 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, including but not limited to fit-up, intermediate passes and final weld.
 - 3. Perform tests of welds as follows. Inspection procedures listed
 - a. Ultrasonic Inspection: ASTM E164. Perform on all full and partial penetration welds.
- I. Field-Bolted Connections:
 - 1. Inspect in accordance with AISC specifications.
 - 2. For bolted connections (bearing-type), all connections shall be visually observed to assure that all bolts, nuts and washers are in place and that all plies of connection material have been drawn together. All bolts shall be verified to be snug tight only.
 - 3. Bolts in slotted holes at expansion joints shall have nuts finger tight with threads damaged.
- J. 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, including but not limited to fit-up, intermediate passes and final weld.

3. Perform tests of welds as follows:

a. Ultrasonic Inspection: ASTM E164. Perform on all full and partial penetration welds.

END OF SECTION 05120.

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes Design and or Build work of the following:
 - 1. Exterior load-bearing wall framing.
 - 2. Exterior non-load-bearing wall framing.
 - 3. Roof rafter framing.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
 - 3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
- C. The extent of cold formed metal framing is shown on the drawings, including notes, elevations and details to show basic layout and location of members, typical connections, and type of steel required.
- D. Section includes all work and supplementary items required to complete the proper installation of the pre-engineered cold formed metal framing as shown on the drawings and specified herein including headers, outriggers, supplemental rafters and incidental framing for a cold formed metal framing assembly within the extent shown on the drawings.
- E. Cold formed metal framing includes planar structural units consisting of welded, screwed or bolted connected members which are fabricated, cut and assembled prior to delivery or at the job site.

1.3 REFERENCES

- A. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- B. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- C. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

- D. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- E. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- G. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- H. AISC - Steel Construction Manual.
- I. AISI - Specification for the Design of Cold-Formed Steel Structural Members; 1996.
- J. AWS D.1.3 - Structural Welding Code - Sheet Steel.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated. Design bridging and other temporary and permanent bracing for same loads as used to design cold formed metal framing plus any temporary loads and permanent loads resulting laterally bracing of members.
 - 1. Engineering Responsibility: Manufacturer's responsibilities include using a qualified professional engineer to prepare structural analysis data for cold formed metal framing. All cold formed metal framing not specifically detailed on the drawings shall be designed to resist forces indicated, by the Contractor, under the direct supervision of a professional engineer registered in the State where the project is located. Engineer/firm shall provide proof of professional liability insurance for said engineering responsibility.
 - a. Design calculations for the Cold formed metal framing designed by the Contractor shall be submitted for the files of the Architect and Engineer. Calculations shall bear the seal of a professional engineer registered in the State where the project is located. Shop drawings containing connections for which calculations have not been received will be returned unchecked as an incomplete submittal.
 - b. Engineering provided by manufacturer shall be a complete package similar to the "Works" package provided by Aegis Metal Framing or equal. Package to include at a minimum, but not limited to the following:
 - 1) Professional Engineer seal on shop drawings and calculations.
 - 2) Design of all trusses including special trusses such as drag strut trusses, blocking trusses and eave blocking to resist lateral load specified to be transferred from the roof diaphragm to the structural system.
 - 3) All truss to truss connections and all trusses to support connections.
 - 4) Permanent Bracing layout diagrams with connection requirements showing bracing sections and details.
 - 5) Construction Bracing (lateral and diagonal) Layout Diagrams for bottom chord plane, web plane and top chord plane showing bracing sections and details.
 - 6) Minimize Construction Bracing by incorporating Permanent Bracing into the construction bracing where possible.

2. Design Loads: As follows:
 - a. Dead Loads: Weights of materials and construction.
 - b. Roof Live Loads: 20 PSF
 - c. Snow Loads: As indicated in drawings.
 - d. Wind Loads: As indicated in drawings.
 - e. Seismic Loads: As indicated in drawings.
 - f. Loads indicated on drawings plus concentrated loads hung from or supported on trusses. Refer to mechanical, electrical and plumbing drawings and specifications for loading information and location. Loading as required by other subcontractors, such as fire protection, shall be coordinated by the General Contractor.
 3. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height.
 - b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - c. Roof Rafter Framing: Horizontal deflection of 1/240 of the horizontally projected span up to 3/4 inch total dead load and 3/4 inch total live load.
 4. 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 (67 deg C).
 5. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch (13 mm).
 6. Holes in Members: Design for holes in members where shown for securing other work to trusses; however, deduct area of holes from the area of chord when calculating strength of member.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

1.5 SUBMITTALS

- A. This project is a 'Total Design and or Build' construction delivery system and review of submittals by the Owner or his representative does not relieve the 'Design and or Build' Contractor of design duties, construction responsibility or liability for improper design, function or performance. The review by Owner is not an independent design check of final plans and methods of construction by and will not in any way relive the 'Design and or Build' contractor of

sole design and construction responsibility for the successful completion and long term stability of the work.

- B. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- C. Shop Drawings: Show layout, spacing, sizes, thicknesses, pitch, span, camber 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. Shop drawings shall include all placement sequences and instructions.
 - 1. Submit all shop drawings as directed by architect.
 - 2. Architect's and Engineer's Shop Drawing Review: Review of shop drawings will be for general considerations only. Compliance with requirements for materials, fabrication, engineering, dimensions, bracing, and erection is the Contractor's responsibility.
 - 3. If there are questions, clarifications, modifications, or other items where information, a response, or approval is requested, such items must be written on the cover sheet to the submittal. Only indicating such items on the shop drawings or within the calculations is not sufficient. Where items are not specifically listed on the cover sheet and subsequently explicitly approved by the Structural Engineer of Record, such items are not to be considered approved or considered.
 - 4. Submit design analysis and test reports indicating loading, section properties, allowable stress, stress diagrams and calculations, and similar information needed for analysis and to insure trusses comply with requirements.
 - 5. 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 licensed to practice in the state where the project is located. Shop drawings which do not contain this information will be returned unchecked.
 - 6. Submittals shall additionally conform to the requirements shown on the General Notes of the project Structural Drawings.
- D. Welding certificates.
- E. Qualification Data: For professional engineer and testing agency.
- F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- G. Research/Evaluation Reports: For cold-formed metal framing.

1.6 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 - 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- G. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 FABRICATOR'S QUALIFICATIONS

- A. Cold formed metal framing shall be designed, fabricated, and erected by a firm which has a record including a minimum of five years of successfully designing, fabricating, and erecting cold formed metal framing assemblies similar to scope required and which practices a quality control program. Fabricators shall additionally be qualified with at least one year experience in using Building Information Modeling (BIM) from inception to producing shop drawings.
- B. Fabricators who wish to qualify for approval under this Section of the specification shall submit evidence of compliance with this specification no later than ten (10) days prior to the bid date. Only those fabricators approved in writing by the Architect prior to the bid date will be accepted.

1.8 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.
- C. Do not store materials on structure in a manner that might cause distortion or damage to supporting structures.

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:
- B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. AllSteel Products, Inc.
 - 2. California Expanded Metal Products Company.
 - 3. Clark Steel Framing.
 - 4. Dale/Incor.
 - 5. Dietrich Metal Framing; a Worthington Industries Company.
 - 6. Formetal Co. Inc. (The).
 - 7. Innovative Steel Systems.
 - 8. MarinoWare; a division of Ware Industries.
 - 9. Southeastern Stud & Components, Inc.
 - 10. Steel Construction Systems.
 - 11. Steeler, Inc.
 - 12. Super Stud Building Products, Inc.
 - 13. United Metal Products, Inc.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: Minimum of Grade 33 or as required by structural performance.
 - 2. Coating: G60 (Z180).
- B. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 (340), Class 1 or 2 or as required by structural performance.
 - 2. Coating: G90 (Z275).

2.3 EXTERIOR LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
 - 2. Minimum Flange Width: 1-5/8 inches (41 mm).
 - 3. Section Properties: as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm) or matching steel studs.

2. Minimum Flange Width: 1-1/4 inches (32 mm).
 3. Section Properties: as required by structural performance.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18ga
 2. Minimum Flange Width: 1-5/8 inches (41 mm).
 3. Section Properties: as required by structural performance.
- D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
1. Minimum Base-Metal Thickness: 18 ga
 2. Top Flange Width: 1-5/8 inches (41 mm).
 3. Section Properties: as required by structural performance.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
 2. Minimum Flange Width: 1-5/8 inches (41 mm).
 3. Section Properties: as required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 ga or matching steel studs.
 2. Minimum Flange Width: 1-1/4 inches (32 mm)].
 3. Section Properties: as required by structural performance.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
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. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. 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. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
 3. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 4. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
- E. Contractors' Option Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - b. Flange Width: 1 inch (25 mm) plus the design gap for 1-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - b. Flange Width: outer deflection track flange width plus 1 inch (25 mm).
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.5 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 ga.
 2. Flange Width: 1-5/8 inches (41 mm) minimum.
 3. Section Properties: as required by structural performance.
- B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section rafter track, with unstiffened flanges; unpunched; of web depths indicated; and as follows:
1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm) or Matching steel rafters.
 2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.6 FRAMING ACCESSORIES

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

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).
- D. Cold formed metal framing to be fabricated at the fabricator's shop in the largest sections possible to transport and erect.
- E. All cold formed metal framing shall be fabricated and erected in strict accordance with the current printed instructions of the approved subcontractor or fabricator.
- F. All cold formed metal framing components shall be straight and true prior to fabrication. Flattening or straightening of components, when necessary, shall be accomplished in a manner so as to not damage the component.
- G. All cold formed metal framing components shall be cut neatly to fit snugly against adjacent members.

- H. No splices will be allowed in cold formed metal framing except as authorized in writing by the Architect or as shown on the approved shop drawings.
- I. Framing components shall be field or shop fabricated and joined to one another by means of welding or through the use of screws.
- J. Completed cold formed metal framing shall be free from twists, bends, or open joints with all members straight and true to line.
- K. Welds must be thoroughly cleaned and wire brushed and primed and painted with a high zinc content paint capable of providing an equal or greater degree of protection than the original G-60 galvanized coating.
- L. Bridging: Fabricate horizontal or diagonal type bridging for cold formed metal framing as required to prevent buckling of members where sheathing applied to the cold formed metal framing members is not present or is not adequate to brace the cold formed metal framing member. Bridging shall transfer all forces to the roof diaphragm.
- M. End Anchorage: Fabricate end anchorages to secure cold formed metal framing to adjacent construction.
- N. Fabricate all clips, angles, henways and other miscellaneous pieces necessary to attach cold formed metal framing to the substructure or to attach other components within this section to one another.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Structural Adequacy: Contractor shall prepare the structure to insure proper and adequate structural support for the materials specified.
- B. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- C. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- D. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or rafter locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

- E. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or rafter locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed rafters, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 1. Anchor Spacing: To match stud spacing.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 1. Stud Spacing: 16 inches (406 mm).
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced a minimum of 48 inches (1220 mm) apart or as required by structural performance. Fasten at each stud intersection.
 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
1. Stud Spacing: 16 inches (406 mm).
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single-leg deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
 4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows but not more than 48 inches (1220 mm) apart or as required by structural performance. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at 96-inch (2440-mm) centers.
 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 ROOF RAFTER INSTALLATION

- A. Install perimeter rafter track sized to match rafters. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install rafter bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten rafters to both flanges of rafter track.
 - 1. Install rafters over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
 - 2. Reinforce ends and bearing points of rafters with web stiffeners, end clips, rafter hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space rafters not more than 2 inches (51 mm) from abutting walls, and as follows:
 - 1. Rafter Spacing: 24 to 48 inches or as required by structural performance.
- D. Frame openings with built-up rafter headers consisting of rafter and rafter track, nesting rafter, or another combination of connected rafters if indicated.
- E. Install rafter reinforcement at interior supports with single, short length of rafter section located directly over interior support, with lapped rafters of equal length to rafter reinforcement.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals as required by structural performance. Fasten bridging at each rafter intersection as follows:
 - 1. Bridging: Rafter-track solid blocking of width and thickness indicated, secured to rafter webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and rafter-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of rafters and secure solid blocking to rafter webs.
- G. Secure rafters to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous rafter framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable rafter-framing assembly.

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports per Specification Section 01410.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Provide Access for testing agency to places where truss work is being fabricated or produced so that required inspections, observations and testing can be accomplished.

- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work where test results indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements regardless of when testing agency completed inspection, observation or testing.

3.8 REPAIRS AND PROTECTION

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

END OF SECTION 05400

1.0 - GENERAL

- 1.1 Scope
Furnish and install all miscellaneous metals as indicated on drawings, including that shown only on Architectural Drawings, and/or as specified.
- 1.2 Submittals
Submit shop drawings for approvals.
- 1.3 Applicable Standards
Fabrication and erection, except as specified otherwise, shall be in accordance with American Institute of Steel Construction (AISC) Specifications for the Design, Fabrication and Erection of Structural Steel for Building.
- 1.4 Qualification
Manufacturer's names, models, or catalog numbers, referred to herein are intended to show the type, quality and intent of items required. Products of other manufacturers equal or better in quality, similar in design are acceptable subject to the Architect's approval.
- 1.5 Substitutions
Substitutions of sections or modifications of details, shall be submitted with the shop drawings for approval. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the contractor and shall be accomplished as no additional cost.

2.0 - PRODUCTS

- 2.1 General Materials
 - A. Metals shall be free from defects impairing strength, durability, or appearance and of the best commercial quality for the purposes specified. All materials shall be new materials and shall have structural properties to sustain safely or withstand strains or stressed to which normally subjected. All exposed fastenings shall be of same material, color and finish as the metal to which applied unless otherwise shown.
 - B. Provide all accessories such as anchors, hangers, belts, toggle bolts, expansion bolts, rods, shelf angles, clip angles, shims, connections, stiffeners, reinforcements, screws, etc., required for proper complete fabrication, assembly and installation of all miscellaneous steel, metal work and masonry. Bolts, screws, expansion bolts, toggle bolts, etc, shall be brass, bronze, stainless steel or aluminum when used with these metals.
 - C. Steel lintels and miscellaneous structural shapes where called for shall be of shapes, lengths and weights, as shown and detailed on the drawings, spanning openings where so indicated, shall be complete with bolts, anchors, etc., for building in. Lintels shall not have less than eight (8") inch bearing upon masonry.
 - D. Galvanized steel shall be hot-dipped galvanized in accordance with the Standard Specifications of the American Hot-Dip Galvanizing Association. Galvanizing shall be done after fabrication.
 - E. All materials shall be well formed to shape and size with sharp lines. Conceal

fasteners where practical. Thickness of metals and details of assembly and supports shall give ample strength.

- F. Welding shall conform to American Welding Society's Standard Code for Arc and Gas Welding in Building Construction. Welding shall be continuous along entire area of contact, except where tack welding is specifically shown or specified. Tack welding will not be permitted on exposed surface. Grind all exposed welds smooth.

2.2 Painting and Protective Coating

- A. Thoroughly clean off all miscellaneous metal, using power tool cleaning to remove all dirt, grease, rust, and scale and foreign matter.
- B. Treat only concealed galvanized metal with galvanized metal primer as per manufacturer's directions before painting. Exposed galvanized metal to be primed and finished under Painting Section.
- C. Unless otherwise specified, paint all metal items, including concealed galvanized metal, one shop coat of Red or Grey oxide zinc chromate TT-P-636-C. Surfaces inaccessible after assembly shall be painted before assembly. Work paint thoroughly into joints, etc. Do not paint bronze, aluminum or stainless steel.
- D. Insulate faces of all metals in contact with different metals, wood, masonry, and/or concrete; give each contact surface one coat approved alkali-resistant bituminous paint. Let both surfaces dry before installing metals.

2.3 Miscellaneous Metal Items

The following items are intended as a guide to such work in this project and do not necessarily limit the scope of this section.

- A. All structural shapes indicated and/or required.
- B. Miscellaneous Steel Lintels. Provide miscellaneous steel lintels indicated on Architectural and/or Structural Drawings or as required. All miscellaneous steel lintels are subject to structural engineer's review and approval.
- C. Exterior Round Member Stair And Ramp Handrail, Guardrails and Brackets as indicated and detailed. Handrail to be 3 ft. min.
- D. Windstop Angle between new and existing construction shall be 4" x 4" x 1/4" continuous angle with vertical slots 16" o.c.; #10 gauge galvanized wire masonry loops 16" o.c. Fill joint to within 1/2" of each face; sealant each side.
- E. Stair Nosings-Treads for concrete filled steel pan stairs and concrete stairs on grade slab shall be equal to American Safety Tread Co., Helena, Alabama, Abrasive Cast Metal Nosing # 820, full width of stairs with anchor devices as recommended by the manufacturer.

3.0 – EXECUTION

3.1 Fabrication

- A. Verify measurements in field for work fabricated to fit job conditions.
- B. Fabricate form work true to detail with clean, straight, sharply defined profiles. Iron

shall have smooth finished surfaces unless indicated otherwise. Shearing and punching shall leave clean, true lines and surfaces.

- C. Fastenings shall be concealed where practical. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to the weather shall be formed to exclude water. Provide holes and connections for the work of other trades.
- D. Joints shall be rigid at adjoining sections for a strong assembly. Weld or rivet permanent connections. Welds shall be continuous and finished flush and smooth on surfaces that will be exposed after installation. Do not use screws or bolts where it can be avoided; where screws or bolts are used, the heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Unexposed welded joints may be continuous or spot welded as required. Remove weld spatter from adjacent surfaces.

3.2 Installation

- A. Erect work in thorough, first class manner with mechanics experienced in the erection of iron work.
- B. Work shall be strong, secure, and adequate for the purpose intended.
- C. Schedule delivery of items to be built into the masonry so as not to delay the progress of the work and to coordinate for proper installation.
- D. Place and properly secure to form work items such as anchors, sleeves, and inserts which are to be cast in concrete.

END OF SECTION

1.0 - GENERAL

1.1. Summary

- A. Provide all labor, materials, equipment and services, and perform all operations required for complete installation of Expansion Control and related work as indicated on the drawings and specified herein.
- B. Work Included: The work of this section shall include, but not be limited to the following:
 - 1. Floor expansion joint cover assemblies.
 - 2. Fire barrier systems.
- C. Related Work Specified Elsewhere
 - 1. Concrete - Section 03300.
 - 2. Unit Masonry - Section 04200.
 - 3. Sealants and Caulking - Section 07910.

1.2. Quality Assurance

- A. Materials and work shall conform to the latest edition of reference specifications specified herein and to all applicable codes and requirements of local authorities having jurisdiction.
- B. Fire Performance Characteristics:
 - 1. Fire Resistance: Where indicated, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance and cycling capability has been determined per UL 2079 by Underwriter Laboratories, Inc. Fire rating not less than the rating of adjacent construction.
 - 2. Surface Burning Characteristics: Composite fiberglass interior wall and ceiling covers shall be U.L.® Tested, classified and labeled reflecting a Class I fire rating in accordance with UL-723 (ASTM E84-91a) test procedures.
- C. Loading Characteristics:
Standard Floor Covers: Shall be designed to withstand a minimum load of 500 lbs. without damage or permanent deformation. Heavy duty covers should withstand a point load of 2,000 lbs.
- D. Single-Source Responsibility: Obtain expansion joint cover assemblies from one source from a single manufacturer.

1.3. Submittals

- A. Product Data: Submit copies of manufacturer's latest published literature for materials specified herein for approval and obtain approval before materials are fabricated and delivered to the site. Data to clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for UV exposure.

- B. Certificates: Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.
- C. Shop Drawings: Submit shop drawings for work specified herein for approval and obtain approval prior to fabrication and shipment of materials to the job site. Shop Drawings showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joinery with other types, special end conditions, anchorage's, fasteners, and relationship to adjoining work and finishes. Include description of materials and finishes and installation instructions.
- D. Samples: Samples of materials specified herein shall be submitted for approval, and approval obtained before materials are delivered to the site. Samples shall include the following:
 - 1. Samples for each type of metal finish indicated on metal of same thickness and alloy to be used in work. 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.
 - 2. Samples of each type of flexible seal to be used in work with color samples as above.

1.4 Delivery, Storage and Handling

- A. Exercise proper care in the handling of all work so as not to injure the finished surface, and take proper precautions to protect the work from damage after it is in place.
- B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical. Assemblies shall be identical to submitted and reviewed shop drawings, samples and certificates.
- C. Store materials under cover in a dry and clean location off the ground. Remove materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost.

1.5 Project Conditions

Where necessary, check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication. Show recorded measurements on final shop drawings and coordinate fabrication schedule with construction progress to avoid delay of work.

2.0 - PRODUCTS

2.1 Manufacturers

Expansion joint cover assemblies specified herein and indicated on the drawings shall be manufactured by Conspec Systems, Inc., P.O. Box 380, Muncy, PA, or other manufacturers with prior written approval.

2.2 Materials

- A. Aluminum : ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6, sheet and plate.

Protect aluminum surfaces in contact with cementitious materials with heavy metal free high solids primer or chromate conversion coating.

- B. Extruded Preformed Seals: Single or multilayered rubber extrusions as classified under ASTM D 2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color as selected by architect from manufacturer's standard colors.
- C. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue in accordance with ASTM E 1399. Tested in maximum joint width condition as a component of an expansion joint cover in accordance with UL 2079 including hose stream testing of wall assemblies at full-rated period by Underwriters Laboratories Inc.
- D. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 Fabrication

- A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline-mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corner, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.
- B. Interior Expansion Joint Covers
 - 1. Flush Cover Assemblies: Provide continuous extruded aluminum frame assemblies of a suitable profile to receive free floating cover plate of design indicated. Furnish colorable, thermoplastic frame seal with rigid edges for positive attachment to frame and center plate free from grooves or ridges. Seals to have flexible core of shore hardness 73 to allow movement of joint width without gaps occurring between seal and cover assembly. Seals to be replaceable without removal of center plate and to be in one of four standard colors unless otherwise specified. All aluminum in contact with concrete to receive heavy metal free/high solids primer, exposed aluminum to be mill finish. All as C/S Flush Series manufactured by Conspec Systems, Inc. Model # GFT 100
- C. Fire Barrier Systems
 - 1. Prefabricated fire barrier assemblies tested in accordance with ANSI/UL 2079 for two-hour certification, unless otherwise detailed and in compliance with ASTM E 1399. Material to carry UL labeled and be subject to Underwriters Laboratories follow-up service for quality assurance. Systems to be installed strictly in accordance with manufacturer's installation instructions. All as C/S Fire Barrier manufactured by Conspec Systems, Inc.
 - 2. For joint widths up to and including 24", the barrier shall be supplied in maximum lengths to minimize field splicing. Fire barrier to consist of intumescent blankets layered to provide a flame and insulation barrier and to accommodate the specified dynamic movement. As Model FB-97.

3. For all joints within enclosed spaces such as chase walls, fire barrier system to include .032" thick galvanized steel cover where conventional expansion joint cover is not used.
- D. Metal Finishes
1. Comply with NAAM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.
 2. Aluminum Finishes
Paint Finish: Shall be inhibited thermocured primer, .02 mil minimum dry film thickness and thermocured fluorocarbon coating containing full 70% Kynar 500 resin, 1.0 mil minimum dry film thickness. Provide color indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

3.0 - EXECUTION

3.1 Examination

- A. Make a thorough examination of all surfaces receiving the work of this Section and before starting the installation, notify the Architect, in writing, of any defect which would affect the satisfactory completion of the work of this section.

3.2 Preparation

- A. Examine the Contract Drawings and specifications in order to insure the completeness of the work required under this Section.
- B. Verify all measurements and dimensions at the job site and cooperate in the coordination and scheduling of the work of this Section with the work of related trades, with particular attention given to the installation of items embedded in concrete and masonry so as not to delay job progress.
- C. Provide all templates as required to related trade for location of all support and anchorage items.

3.3 Installation

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.
- B. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.
- C. Perform all cutting, drilling and fitting required for installation of expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels.
- D. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.

- E. Set floor covers at elevations to be flush with adjacent finished floor materials. If necessary, shim to level, but ensure base frames have continual support to prevent rocking and vertical deflection.
- F. Locate anchors at interval recommended by manufacturer, but not less than inches from each end and not more than 24 inches on centers.
- G. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames.
- H. Adhere flexible filler materials (if any) to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
 - 1. Installation of Extruded Preformed Seals: Install seals to comply with manufacturer's instruction and with minimum number of end joints.
 - 2. For straight sections provide preformed seals in continuous lengths.
 - 3. Vulcanize or heat-seal all field splice joints in preformed seal material to provide watertight joints using manufacturer's recommended procedure.
 - 4. Apply manufacturer's approved adhesive, epoxy, or lubricant-adhesive to both frame interfaces prior to installing preformed seal.
 - 5. Seal transitions in accordance with manufacturer's instruction.
- I. Installation of Fire Barrier
 - 1. Install fire barrier in accordance with federal, state and local building codes using manufacturer's recommended procedures.
 - 2. Install transition and end joints to provide continuous fire resistance and in manufacturer's instructions.

3.4 Cleaning and Protection

Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work under this section consists of all rough carpentry work.
- 1.2 General
- A. Rough carpentry shall generally include all rough framing, furring, grounds, bucks, blocking and such other wood work as required.
 - B. Carpentry shall also include all temporary bracing, shoring and centering as required for the support or protection of the work.
- 1.3 Cooperation With Other Trades
The work under this section includes the necessary cutting and patching required for the proper installation of work of other trades. Work which is to be built in by others shall be accurately positioned and properly built in to secure the work of this section. Temporary centering, bracing and shoring shall be provided as required for the support and protection of masonry work during construction.
- 1.4 Delivery and Storage
Lumber and other materials specified herein shall be delivered, handled and stored in order to prevent damage and absorption of excess moisture. Lumber shall be stored in such a manner as to insure proper ventilation and protection from the weather.

2.0 - PRODUCTS

- 2.1 Lumber
- A. All dimensional lumber used under this section shall be thoroughly dried No. 2 Southern Yellow Pine or No. 2 Douglas Fir of sizes, shapes and lengths required. Moisture content shall not exceed 19% at time of installation.
 - B. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from structural defects. Warped or twisted wood shall not be used.
 - C. Lumber grades shall conform to the grading rules of the manufacturer's association under whose rules the lumber is produced. All lumber shall be grade-marked.
- 2.2 Wood Treatment
- A. Lumber in contact with concrete or masonry, including roof blocking, cants and nailers and/or as indicated, shall be pressure preservative treated in accordance with American Wood Preservers Institute Standard No. LP-2. Creosote, oil or similar materials which bleed shall not be used.
 - B. Lumber for blocking and furring, located within interior concealed spaces shall be non-combustible. Treatment shall be equal to "Flame-Proof" by Osmose Wood Preservative; "Non-Con" by Koppers, or approved equal. Lumber shall be UL certification marked.
 - C. Pressure Treated wood associated with roof and roof edge construction which will be in contact with steel or galvanized steel components shall be wrapped or covered with Ice & Water Shield to prevent direct contact between pressure treated wood and steel.
- 2.3 Fastening Devices
Nails, screws, bolts, anchors, washers, clips, shields, power actuated devices and other

rough hardware shall be of the sizes and types indicated on the drawings or as required to adequately anchor all members. Anchors for nailing strips and blocking shall have nuts and washers countersunk and bolts cut off flush with the top of the wood nailer. All fasteners in contact with pressured treated wood shall be galvanized.

2.4 Temporary Closures

Provide batten doors with locks at all exterior openings. Appropriate protection against weather and life safety shall be maintained throughout the job.

2.5 Blocking

Provide solid blocking at all grab bars, millwork cabinets and wall mounted units. Coordinate with Installer and/or Manufacturer.

3.0 - EXECUTION

3.1 Installation

- A. All work shall be installed plumb and true, and secured in place with proper fastenings so as to make rigid and firm.
- B. The work of this section shall be performed in the best practice relating to the trade so as to carry out the intent of the drawings and to properly accommodate the work of all trades.
- C. Cut ends or faces of all treated wood shall be brushed treated with preservative.

END OF SECTION

1.0 - GENERAL

1.1 Scope

- A. The work under this section consists of all finish carpentry, millwork and related items.
- B. Millwork shall be defined as follows: "All exterior and interior woodwork exposed to view in the finished building, except lumber yard or specialty items. All exposed wood, plywood, hard plastic and wood doors are included."
- C. All millwork shall be produced by the same source of supply to coordinate matching of materials.

1.2 Submittals

- A. Shop drawings shall be furnished on all millwork to the architect for approval prior to fabrication. These drawings to show size, arrangement, type of material, connections and relationship to adjacent work.
- B. All shop drawings shall show species of woods and the manufacturer's name for all manufactured items.
- C. When required, contractor shall submit a sample unit as requested.
- D. Submit samples of decorative laminate colors, patterns, and textures for semi-exposed materials for architect's selection. Samples of other materials or hardware shall be available if requested.

1.3 Applicable Standards

- A. The Quality Standards of the American Woodwork Institute (AWI) shall apply and, by reference, are made a part of this specification.
- B. Millwork materials and workmanship not shown, specified, or normally furnished to a higher degree of quality shall conform to custom grade requirements of the AWI Quality Standards.

1.4 Delivery and Storage

- A. When all millwork items are ready for shipment to the job site, the architect shall be notified through the contractor so that either may inspect the work in the mill prior to shipment.
- B. All materials shall be inspected by the contractor's superintendent upon receipt at the job site. No faulty or damaged materials shall be received. It shall be the contractor's responsibility to produce finished items of work in first class condition.
- C. No interior millwork shall be delivered until the building has been dried out. Heat shall be required in cold or humid weather.
- D. No trim shall be delivered or placed until the areas of the building in which the trim is to be placed are thoroughly dry and ready for the installation. The building shall be enclosed and heated. Allow wood to acclimate for 7-10 days prior to installation.

2.0 - PRODUCTS

2.1 General

- A. All materials shall be of the best of their respective kinds. All materials used in

finished work shall be clear, free from cracks, checks, knots and other imperfections that may interfere with the proper completion of the work and any warped or otherwise imperfect work shall be removed and replaced.

- B. All plywood shall have a grade-trademark which shall identify each panel of plywood as to type, grade and conformance to CS45 or CS122 (current issues). If use is exposed to weather or excessive moisture, plywood shall be of the exterior type. Exposed faces and faces to receive plastic laminates shall be "A" grade. Panels used for concealed cabinet parts may be C-D grade. Thickness and application details shall be as shown on drawings or required for the intended use.

2.2 Interior Woodwork

- A. Lumber used for painted interior woodwork, unless otherwise indicated, shall be one of the following:
 - 1. Fir - Coast or Inland Douglas White
 - 2. Pine - Ponderosa, Southern
 - 3. Redwood
 - 4. Cypress
 - 5. Yellow Poplar
 - 6. Grade of lumber used shall be second grade for paint finish, except cypress may be third grade.
- B. Hardwood: All references to hardwood shall imply stain grade oak.
- C. All interior plywood to be painted shall be Natural Birch.
- D. All interior woodwork and plywood to be stained or finished natural shall be Premium Grade Select White Birch or as specified on drawings. Veneer shall be rotary cut or as indicated on drawings or related specification sections. Semi-exposed parts, as defined by AWI, of natural or stained casework shall be Natural Birch.
- E. Lumber shall be kiln dried with an average moisture content of 6% to 11%.
- F. Particle board shall be U. S. Plywood Corp. "Novoply" Weyerhaeuser Company "Timblend", or approved equal of thickness shown. Factory sanded or sealed or filled, 2 sides.

2.3 Plastic Laminate

- A. Plastic laminate shall be Nevamar, Wilson-Art, Formica, Laminart, Arborite, Pionite, 1/16" thick. See Finish Legend and Schedule for color selections.
- B. Backing sheet shall be high pressure laminate, .020" minimum thickness. Plastic laminate to be used on all interior open shelves. Melamine is not acceptable unless it matches the selected plastic laminate.
- C. The adhesive shall be that recommended by the manufacturer of the laminated plastic used.
- D. Edging Materials:
 - 1. 1mm PVC banding, machine applied; match laminate as scheduled.
 - 2. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius;

match laminate as scheduled

2.4 Rough Hardware

All exposed bolts or other anchors shall be chrome-plated brass.

2.5 Finish Hardware

Furnish and install all finish hardware for millwork items including, but not necessarily limited to, cabinet door and drawer pulls and latches, adjustable shelf standards and brackets, and hardware for doors less than 1-3/8" thick. Hardware finish shall match room door hardware finish.

2.6 Thickness of Members

All thicknesses shall be in accordance with the maximum possible dressed size from standard lumber. If widths or thicknesses are not available in hardwood, gluing may be used on widths over 5-1/4" or thicknesses over 1-1/6".

2.7 Workmanship

- A. All exposed surfaces and edges shall be finished smooth and be free of saw cuts, marks or defacement. All joints shall be accurately and neatly made and fit.
- B. End grain shall be concealed. Exposed edges of plywood shall present a finish the same as the finished sides.
- C. Work shall be scribed and fit to other finished surfaces in a careful manner. Should other work be damaged or disturbed, it shall be made good at the expense of this contractor.
- D. Work shall be assembled at the mill insofar as is practicable and delivered ready for erection. When necessary to cut and fit on job, the material shall be made up with ample allowance for cutting.
- E. This contractor shall verify all measurements at the building and shall examine all adjoining work on which his work is dependent.
- F. Millwork shall be executed in accordance with the approved shop drawings, the workmanship shall be of first quality and the construction of all parts shall be of the best current practice. The work shall be assembled so as to hold together with close joints, fastenings shall be concealed, and all work shall be properly and firmly backed and blocked as required. Provision shall be made for expansion and shrinkage.
- G. Exposed surfaces shall be machine-sanded to an even, smooth surface, nails set, ready for finishing or pre-finishing when noted. All woodwork shall be dry, clean, and smooth before any finishing materials are applied. All nail holes, cuts, cracks and other defects shall be treated so as to be unnoticeable.
- H. All wood surfaces to be set against masonry and/or concealed after erection shall be given a heavy coat of sealer. All woodwork to have paint finish shall be primed under the PAINTING SECTION.
- I. All transparent finished (i.e., stained) woodwork shall be shop finished by Millwork Contractor.
- J. All caulking to match laminate or stain color.
- K. All millwork/casework cabinets in contact with finish floor shall receive scheduled base.

2.8 Carpentry and Millwork Items

- A. The following millwork items are intended to guide such work in this project and do not necessarily limit the scope of this section.
- B. Where not otherwise specified, shelving, cabinet work and millwork of all types shall conform with requirements of Premium Grade of "Quality Standards of the Architectural Woodwork Industry" (Architectural Woodwork Institute).
- C. Wood Base and Shoe Mould - Shall be as detailed on drawings. Base shoe mould lengths to be maximized wherever possible. Wood scraps and remnants used for base material is NOT acceptable. Minimum 8' lengths.

2.9 Materials and Construction

- A. MDF (Medium Density Fiberboard)
Shall be equal to Premier7 MDF, Plus Grade. MDF is to be shop finished by Millwork Contractor with a transparent stain. The actual surface of the MDF is to be visible through the stain color. Stain colors are to match paint selections indicated on drawings. Millwork Contractor to provide stain samples to Architect for approval prior to fabrication.
- B. Panels - End panels, shelves, bottoms and partitions of 3/4" Birch plywood, "Good" grade on all surfaces or plastic laminate covered particle board as approved. All other surfaces may be A grade fir plywood. All edges exposed to sight shall be self edged and sanded smooth and flush.
- C. Doors - Construction of 3/4" Birch plywood, "Good" grade or plastic laminate covered particle board as approved. All edges shall be self edge.
- D. Drawers - Front identical to doors above. Back minimum of 1/2" A-A Grade fir plywood. Sides of solid hardwood of sound grade. Bottoms of 1/4" plywood or 1/4" brown welded fiber board. Front and back connection shall be rigid type. Bottoms shall be let into front, back and sides approximately 1/4 of an inch. Drawer interiors to be Melamine.
- E. Backs - Backs shall be a minimum of 1/4" plywood or 1/4" brown welded fiber board. Open to view 1/4" Birch plywood. All open-to-view backs are to receive plastic laminate.
- F. Adjustable Shelves - 3/4" thick for maximum spans of 30". 1-1/8" thick for maximum spans of 42". All open-to-view shelves are to receive plastic laminate.
- G. Cabinet Base - Cabinet Base and tall units shall have a site-built toe base constructed of 3/4-inch (minimum) lumber unless otherwise shown on the drawings. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawings. Particle board is not acceptable.
- H. Finishes - Tops, edges, and backsplashes and any other areas noted shall be plastic laminate covered.
- I. Cabinet Hardware - Contractor shall furnish hardware equal to that as manufactured by Stanley, as hereinafter specified. All hardware to be Brushed Chrome, unless indicated otherwise on drawings.

Pull Handles -

4" wire pull, brushed chrome finish. Two pulls on drawers over 30" wide.

Drawer Guides -

Regular, knee space and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature. Paper storage, 150-pound load rated epoxy coated steel slides.

File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.

Door Hinges - Five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.

Doors 48 inches and over in height have 3 hinges per door.

Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.

1. Finish to be selected by Architect.

3.0 - EXECUTION

3.1 Shop Assembly

When it is possible, all items of millwork which can be carried into the building through doorways or windows shall be shop assembled. When it is impractical to shop assemble the entire item in one piece, it shall be shop assembled in sections and perfectly fitted in place on the job by thoroughly experienced and competent mechanics. Where job joining requires gluing, it shall be done by the same method used in the Shop.

3.2 Installation

- A. All finish carpentry and millwork of every sort shall be put up plumb or level, and straight and true. Trim put up with proper grounds and firmly secured. All work fitted and scribed to other work in a careful manner as not to injure the surface in any way. All nailing shall be blind wherever possible, but where not possible, the nailing driven and set so as to be not visible in the finish.
- B. All trim to be free from defects impairing durability or fitness for receiving finish. All trim properly sanded at mill and hand sanded at the job.
- C. Finished surfaces of interior millwork, detailed or scheduled to be painted, shall be left ready for treatment by the painter. The jointing and framing of all members of the finished millwork shall be executed in accordance with the best and latest recognized mill practice.
- D. This contractor shall cooperate with contractors for other trades with which his work comes in contact.

3.3 Finish Hardware

- A. Install items of hardware furnished under FINISH HARDWARE SECTION.
- B. Hardware shall be accurately fitted and securely attached, without damage to metal or woodwork, and care shall be taken to not mar or injure any work.
- C. Hardware shall be protected as approved or removed for painting.

- D. Upon completion of the work, hardware shall be demonstrated to work freely, keys shall be fitted into their respective locks and upon acceptance of the work, all keys shall be tagged and delivered to the Owner.
- E. All open -to- view shelves are to receive heavy duty, double cleated adjustable standard hardware.

END OF SECTION

1.0 - GENERAL

1.1 Section Includes

- A. Surface preparation.
- B. Application of a solvent type liquid applied dampproofing membrane.

Note: This product shall not be installed until adjacent roof construction has been dried-in. CMU walls must be dry on both sides before application.

1.2 Related Sections

- A. Section 03300 - Cast-in-Place Concrete.

1.3 References

- A. Spray or Brush-on dampproofing coating
 - 1. ASTM D4479-00 - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.
- B. Trowel applied dampproofing coating
 - 1. ASTM D4586-00 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

1.4 Submittals

- A. Comply with Section 01350 - Submittal Procedures.
- B. Submit manufacturer's product data and application instructions.

1.5 Delivery, Storage, and Handling

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean dry area in accordance with manufacturer's instructions.
- C. Store at temperatures of 40°F (5°C) and above to facilitate handling.
- D. Do not store at temperatures above 90°F (32°C) for extended periods.
- E. Keep away from sparks and flames.
- F. Protect materials during handling and application to prevent damage or contamination.

1.6 Environmental Requirements

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Do not apply membrane when air or surface temperatures are below 35°F (2°C).
- C. Do not apply to frozen concrete.
- D. Do not apply when rain is imminent.

2.0 - PRODUCTS

2.1 Manufacturer

- A. W.R. Meadows, Inc or pre- approved manufacturer with similar solvent based products.

2.2 Materials

- A. Spray applied solvent dampproofing should be an asbestos-free, non-fibred asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content.
 - 1. Spray-Mastic by W.R. Meadows.
- B. Brush applied solvent dampproofing should be an asbestos-free, fibred, asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content. For use to protect exterior below-grade masonry walls.
 - 1. Semi-Mastic by W.R. Meadows.
- C. Trowel applied solvent dampproofing should be a heavy bodied, asbestos-free fibred, asphalt compound that meets the U.S. EPA Architectural Coatings Rule requirements for VOC content. For exterior below grade masonry wall surface application.
 - 1. Trowel-Mastic by W.R. Meadows.

2.3 Accessories

- A. Waterproofing Protection Course: Protection Course.
- B. Rolled Matrix Drainage System: Mel-Drain™ Rolled Matrix Drainage System.

3.0 - EXECUTION

3.1 Examination

- A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 Surface Preparation

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Concrete surfaces must be clean, smooth and free of standing water.
- E. Patch all holes and voids and smooth out any surface misalignments.

3.3 Application

- A. Apply dampproofing in accordance with manufacturer's instructions.
- B. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.

3.4 Protection

- A. Protect membrane on vertical and horizontal applications with immediate application of protection course, if no drainage system is used, or rolled matrix drainage system.
- B. Backfill within 24-48 hours using care to avoid damaging the dampproofing.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work under this section consists of all building insulation except rigid roof insulation.
- 1.2 Submittals
Submit samples of all materials hereinafter specified for approval.
- 1.3 Protection
All thermal insulation shall be maintained dry throughout construction.

2.0 - PRODUCTS

- 2.1 Material
 - A. Masonry Foam Fill Insulation shall be approved equal to:
 - 1. Core Foam Masonry Foam Insulation by cfiFOAM.
 - 2. Other Pre-approved manufacturers:
 - a. Applegate C Foam Insulation by Applegate R Foam, Inc.
 - b. Core-Fill 500 by Tailored Chemical Products, Inc.
 - 3. Minimum Product Performance Standards
 - a. Fire-Resistance Ratings: Foam shall neither add to nor detract from fire-resistance ratings of insulated fire-resistance rated CMU walls per prevailing building codes.
 - b. Surface Burning Characteristics: Class A per ASTM E84; Flame Spread Index ≤ 25 ; Smoke Developed Index ≤ 450 .
 - c. Thermal Resistance: R-4.6/inch @ 75°F per either ASTM C518 or ASTM C177
 - d. Potential Heat: ≤ 100 Btu/lb. when tested per NFPA 259 (ASTM D5865).
 - 4. Installation Guidelines
 - a. Fill all open cells and voids in hollow concrete masonry walls where shown on the drawings.
 - b. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" diameter holes drilled to access each column of block cells e.g. 8" o/c beginning approximately four (4) feet above the finished floor.
 - c. Repeat this procedure at 10' to 16' intervals above the first horizontal row of holes (or as needed) until the empty core cells are completely filled.
 - d. In walls where horizontal bond beams occur, repeat the procedure above the bond beams to assure insulating the entire wall.
 - e. If "Hi-Flow" nozzles by cfiFOAM, Inc. are used, foam may be injected at up to twenty (20) foot vertical intervals.
 - f. Patch holes with mortar and score to resemble adjacent surfaces. Insulation shall not be injected into wet walls.
 - 5. Quality Assurance
 - a. Manufacturing Standards: Provide insulation from a single approved source. Product components shall be of the same brand from the same approved source arriving at the site either pre-mixed according to the manufacturer's printed instructions or in unopened factory sealed containers.
 - b. Installer Qualifications for Foamed-In-Place Masonry Insulation:
 - 1.) Engage an authorized contract installer who has been trained, authorized and equipped by the product

manufacturer.

- c. At the Architect's request, the Installer shall provide infrared scanned images of the work prepared by a "Block Wall Scan IR" or equivalent trained IR technician to confirm that empty core cells are filled with foam insulation.

- 1.) Insulation voids shall be foamed at no added cost to the Owner.

- B. Rigid thermal insulation shall be 1 ½ " thick by 16" wide for cavity walls and 24" wide if indicated for slabs. The insulating material shall have a minimum compressive strength of 25 psi and maximum water vapor transmission rate of 1.1 perm-inch and shall conform to ASTM C578, Type III-IV, R-value/inch @ 75 degrees F 5.0. Adhesive, in cavities, shall be equal to Styrofoam brand mastic #7 or #11 as distributed by Dow. All joints shall be taped.

3.0 - EXECUTION

3.1 Installation

- A. Masonry foam fill insulation shall be provided at all exterior wall assemblies and where indicated to thoroughly fill CMU cells and voids continuous from bottom to top of exterior and applicable masonry walls. Install in accordance with manufacturer's printed recommendations and procedures.
- B. Rigid thermal insulation
 - 1. Walls - Adhere insulation to walls in a horizontal position, closely butted and with vertical joints staggered. Provide joint mastic and joint tape to the foam and apply in accordance with manufacturer's recommendations.
 - 2. During storage and insulation, observe good fire safety practices, including job site housekeeping.
 - 3. If adhesive is required, use mastic for bonding foam board to non-absorbent surfaces such as dense concrete, metal, brick, glass, and paint.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work under this section consists of all preformed metal soffit system.
- 1.2 For purposes of designating type and quality for work of this section, drawings and specifications are based on products of MBCI. Other pre-approved manufacturers include: ALSCO. Whenever substitute products are to be considered, supporting technical literature, samples, and drawings must be submitted for approval.
- 1.3 Work Required
This contractor shall provide all necessary material, trim, accessories, labor, and equipment for the complete, finished installation of the Preformed V-Groove Soffit System.
- 1.4 Submittals
Shop drawings for approval.
Color samples for approval.
- 1.5 Guarantee
All materials and workmanship covered by this section shall be guaranteed against peeling, blistering, chalking, or fading for a period of ten (10) years from date of final acceptance of the Contract, or from occupancy of the building whichever is earlier.

2.0 - PRODUCTS

- 2.1 Materials/Finishes
 - A. Panels shall be V-Groove, 12" wide, perforated, rolled to a depth of 3/8" grooves, with V-Grooves at 6" on center spacing. Vented soffits shall have 92% of the flat panel area vented to allow for free breathing space. All fasteners shall be concealed.
 - B. HW-1112 perforated aluminum panels.
 - C. Paint finish shall be baked on, (Signature 200 colors) mill applied while in coil form to provide a finish that is uniform in color, gloss, texture, and thickness. Exterior side of panels to be a standard color of the manufacturer as selected by the architect. Backside of panels to be prime coated.
 - D. All exposed trim members shall be same as soffit panels, either factory fabricated or field formed to exact dimensions from flat sheets furnished by manufacturer. Hold down clips, EPDM top and bottom closures and fasteners as recommended by manufacturer in colors to identically match panels.

3.0 - EXECUTION

- 3.1 Application
Soffit panels shall be applied in accordance with manufacturer's specification and instructions, using standard or special components as required including: panels, closure members, caps, frame assemblies, clips, gussets, fasteners, blocking, etc.
- 3.2 Erection
 - A. Soffit system shall be installed level and plumb in accordance with manufacturer's installation instructions by erectors familiar with and competent in the installation of preformed metal siding systems.

- B. After erection, the general contractor shall adequately protect exposed portions of the system from damage.
- C. Metals contractor shall remove from the site all debris associated with this phase of the construction.

END OF SECTION

SECTION 07540 – THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

1.0 - GENERAL

1.1 Description

- A. The work of this section consists of providing TPO Adhered Roofing System as outlined below:
 - 1. Apply the Adhered Roofing System in conjunction with the indicated roof Insulation.

1.2 Scope Of Work

- A. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of the .060" thick minimum (white, gray or tan color as selected by Architect) reinforced TPO (Thermoplastic Polyolefin) reinforced membrane Adhered Roofing System including flashings and insulation as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details to meet performance criteria specified herein.
- B. The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.
- C. The roofing contractor shall confirm all given information and advise the Architect, prior to bid, of any conflicts that will affect their cost proposal.
- D. Any contractor who intends to submit a bid using a roofing system other than the approved manufacturers must submit for pre-approval in writing ten (10) days prior to the bid date. Comply and submit in accordance with Section 01360.

1.3 Related Sections

- A. Section 07621 – Sheet Metal Work Flashing and Trim
- B. Section 10428 – Roof Information Plaque

1.4 Submittals

- A. Prior to starting work, the roofing contractor must submit the following:
 - 1. Shop drawings showing layout, details of construction and identification of materials.
 - 2. A sample of the manufacturer's Membrane System Warranty.
 - 3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
 - 4. Attachment pattern for insulation and membrane to comply with wind zone requirements.
- B. Upon completion of the installed work, submit copies of the manufacturer's final inspection to the Architect prior to the issuance of the manufacturer's warranty.

- C. **Manufacturer Certificates:** Signed by manufacturer certifying that roof panels comply with performance requirements specified in "Performance Requirements" Article.
1. Submit evidence of meeting performance requirements.
 2. Submit signed approval of project drawings and specifications meeting manufacturer's requirements for specified manufacturer's warranties.
 3. Submit evidence of Installer/contractor meeting requirements for specified warranties.
 4. Contractor to register roofing project with the manufacturer prior to the pre-roofing conference and prior to submitting shop drawings. As part of the submittals package, copy of the acknowledgement of the manufacturer is required.

Note: **Copy of Acknowledgement Letter from manufacturer that project has been registered shall be included with submittals and prior to pre-roofing conference.**

A minimum of three (3) field inspections shall be made by a technical (non sales) representative of the Roofing System Manufacturer at start, mid-way and upon completion of the work. Written reports shall be made and copies of these reports must be submitted to the Architect within 3 days of the inspections. These inspections must be made by a manufacturer's representative employed by the manufacturer. Notify Architect 72 hours prior to inspections.

1.5 Product Delivery, Storage and Handling

- A. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacturer's name, brand name and installation instructions intact and legible. Deliver in sufficient quantity to permit work to continue without interruption.
- B. Comply with the manufacturer's written instructions for proper material storage.
1. Store membrane in the original undisturbed plastic wrap in a cool, shaded area. Membrane that has been exposed to the elements for approximately 7 days must be prepared with Commercial Innovations Weathered Membrane Cleaner (or other Manufacturer's recommended product) prior to hot air welding.
 2. Store curable materials (adhesives and sealants) between 60F and 80F in dry areas protected from water and direct sunlight. If exposed to lower temperature, restore to 60F minimum temperature before using.
 3. Store materials containing solvents in dry, well ventilated spaces with proper fire and safety precautions. Keep lids on tight. Use before expiration of their shelf life.
- C. Insulation must be on pallets, off the ground and tightly covered with waterproof protective materials.
- D. Any materials which are found to be damaged shall be removed and replaced at the contractor's expense.

1.6 Work Sequence

- A. Schedule and execute work to prevent leaks and excessive traffic on completed roof sections. Care should be exercised to provide protection for the interior of the building and to ensure water does not flow beneath any completed sections

of the membrane system.

- B. Do not disrupt activities in occupied spaces.

1.7 Site Conditions

- A. If discrepancies are discovered between the actual conditions and those noted on the drawings, immediately notify the Architect in writing. Necessary steps shall be taken to make the building watertight until the discrepancies are resolved.

1.8 Pre-Roofing Conference

- A. Pre-Installation Roofing Conference: Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of roofing system installation and associated work.

Require attendance of installer of each component of associated roofing work, Contractor, Architect, Owner, Alabama Construction Management, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities. Objectives of conference include:

1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
 2. Review roofing system requirements (drawings, specifications and other contract documents).
 3. Review required submittals both completed and yet to be completed.
 4. Review construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 5. Review required inspection, testing, certifying and material usage accounting procedures.
 6. Discuss weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
 7. Record discussion of conference including decisions and agreements (or disagreements) reached and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
- B. The Architect will record the proceedings and distribute them to the participants for record.
 - C. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved to the satisfaction of the Owner and Architect.
 - D. **The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is**

not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.

1.9 Job Site Protection

- A. The roofing contractor shall adequately protect building, paved areas, service drives, lawn, shrubs, trees, etc. from damage while performing the required work. Provide canvas, boards and sheet metal (properly secured) as necessary for protection and remove protection material at completion. The contractor shall repair or be responsible for costs to repair all property damaged during the roofing application. **Do not store roofing materials on the roof.**
- B. During the roofing contractor's performance of the work, the owner will continue to occupy the existing adjacent building. The contractor shall take precautions to prevent the spread of dust and debris, particularly where such material may sift into the building. The roofing contractor shall provide labor and materials to construct, maintain and remove necessary, temporary enclosures to prevent dust or debris in the construction area(s) from entering the remainder of the building.
- C. Do not overload any portion of the building, by either use of or placement of equipment, storage of debris, or storage of materials.
- D. Protect against fire and flame spread. Maintain proper and adequate fire extinguishers.
- E. Take precautions to prevent drains from clogging during the roofing application. Remove debris at the completion of each day's work and clean drains, if required. At completion, test drains to ensure the system is free running and drains are watertight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.
- F. Store moisture susceptible materials above ground and protect with waterproof coverings.
- G. Remove all traces of piled bulk material and return the job site to its original condition upon completion of the work.

1.10 Safety

- A. The contractor shall be fully responsible for all means and methods as they relate to safety and shall comply with all applicable local, state and federal requirements that are safety related. Safety shall be the responsibility of the contractor. All related personnel shall be instructed daily to be mindful of the full time requirement to maintain a safe environment for the facility's occupants including staff, visitors, workers and the occurrence of the general public on or near the site.

1.11 Workmanship

- A. Applicators installing new roof, flashing and related work shall be factory trained and approved by the manufacturer they are representing.
- B. All work shall be of highest quality and in strict accordance with the manufacturer's published specifications and to the Owner's satisfaction.

- C. There shall be a supervisor on the job site at all times while work is in progress.
- D. The contractor shall be responsible for weathertightness under this section.

1.12 Quality Assurance and Performance Requirements

- A. The membrane roofing system must achieve a UL Class A and FM1-90 or higher rating. (No exceptions). Provide additional materials or higher quality to meet FM-I-90 and wind speed requirements of 120 mph or higher (Risk Category 3) and Severe Hail (SH) requirements. (No exclusions for hail less than 2")
- B. Unless otherwise noted in this specification, the roofing contractor must strictly comply with the manufacturer's current specifications and details.
- C. The roofing system must be installed by an applicator authorized and trained by the manufacturer in compliance with shop drawings as approved by the manufacturer.
- D. All roofing materials shall be new and provided by same source as required to comply with manufacturer's system warranty.
- E. Provide adequate number of experienced workmen regularly engaged in this type of work who are skilled in the application techniques of the materials specified including operation of hot air welding equipment and power supply. Provide at least one thoroughly trained and an experienced superintendent on the job at all times roofing work is in progress.
- F. There shall be no deviations made from this specification or the approved shop drawings without the prior written approval of the Architect. Any deviation from the manufacturer's installation procedures must be supported by a written certification on the manufacturer's letterhead and presented for the Architect's consideration.
- G. Upon completion of the installation, the applicator shall arrange for an inspection to be made by a technical representative of the membrane manufacturer in order to determine whether or not corrective work will be required before the warranty will be issued. Notify the Architect seventy-two (72) hours prior to the manufacturer's final inspection.
- H. FMG Listing: Provide roofing membrane, base flashings, and component materials that meet the requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
 - 1. Fire/Windstorm Classification: UL Class A – FM 1-90 (120 mph wind speed minimum) Risk Category 3
 - 2. Hail Resistance: Severe Hail (SH) (No exclusions for 2" hail)
- I. Membrane Roofing System must meet or exceed impact resistance requirements of IBC 2015 Section 1504.7 and Wind Speed Requirements as applicable to the Zone where the Building is located as required by the IBC 2015 Edition.

- J. Certification of Roofing System
Contractor(s), Roofing Material Manufacturer, and Roofing Material Manufacturer's Field Inspector shall each execute the Certification of Roofing System, a copy of which immediately follows this Section.
- K. Product must meet Testing requirements of ASTM D5019, "Standard Specification for Reinforced Non Vulcanized Polymeric Sheet Used in Roofing Membrane"

1.13 Job Conditions and Special Handling

- A. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.
- B. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.
- C. When loading materials onto the roof, the Authorized Roofing Applicator must comply with the requirements of the Owner/Architect to prevent overloading and possible disturbance to the building structure.
- D. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.
- E. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.
- F. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters. Remove debris and loose fasteners promptly.
- G. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.
- H. New roofing installation shall be complete and weather tight at the end of each work day.
- I. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.14 Warranty

- A. Provide manufacturer's special 20 year weathertightness No Dollar Limit (NDL) Roofing System Warranty. Hail Resistance: Severe Hail (SH) (No exclusions for 2" hail)
- B. Pro-rated System Warranties shall not be accepted.
- C. The roof and associated work shall be guaranteed by the General Contractor

against leaks from faulty or defective materials and workmanship for a period of five (5) years, starting on the date of acceptance of the project by the Owner.

- D. **Manufacturer's roofing guarantees shall contain language regarding the governing of the guarantee by the State of Alabama, otherwise amend the requirement and state that the Laws of the State of Alabama shall govern all such guarantees.**
- E. Roofing Installers Warranty: Submit roofing Installer's warranty on Installers letterhead, signed by Installer, covering all work of this contract, including incidental items, for the following warranty period:

Warranty Period: Five (5) years from date of Substantial Completion.
- F. State of Alabama General Contractor's Roof Guarantee: Covering Work of this Section, including all components of the roofing system for the following warranty period:

Warranty Period: Five (5) years from date of Substantial Completion.
- G. All warranties shall be dated within 30 days of substantial completion.
- H. **The Representative for the Roofing Materials Manufacturer shall bring a copy of the warranty(ies) for the roofing material(s) for comparison to the warranty(ies) specified. This sample warranty is required to be job specific, covering all requirements, per the specifications. If the sample warranty is not provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.**

2.0 - PRODUCTS

2.1 General

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 - 1. Carlisle SynTec, Incorporated. (60 mil)
 - 2. Johns Manville (60 mil)
 - 3. Commercial Innovations, Inc (SealTite) (60 mil)
 - 4. Versico Roofing System (TPO - Versiweld - 60 mil)
- B. All products (including insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the system warranty.

2.2 Membrane

Provide 60 mil min. thick reinforced TPO (Thermoplastic Polyolefin) membrane as needed to complete the roofing system. Membrane thickness over the reinforcing scrim (top-ply thickness) shall be nominal 15 mil thick. Color to be white.

2.3 Insulation/Underlayment

- A. When applicable, insulation shall be installed in multiple layers. The first and second layers of insulation shall be mechanically fastened to the substrate in accordance with the manufacturer's published specifications.
- B. Insulation shall be as indicated.
- C. Coverboard (SecuRock, Densdeck, ½" SecurShield HD ISO)

2.4 Adhesives and Cleaners

- A. All products shall be provided from approved manufacturer and specifically formulated for the roofing system specified herein.
 - 1. Bonding Adhesive
 - 2. Edge Sealant
 - 3. Sealer: Water Cut-Off Mastic (as recommended by roofing manufacturer)
 - 4. Pocket Sealant: TPO Molded Pocket Sealant (as recommended by roofing manufacturer)
 - 5. Membrane Cleaner

2.5 Fasteners and Plates

- A. To be used for mechanical attachment of insulation and to provide additional membrane securement:
 - 1. Pre-Assembled Fasteners: A pre-assembled 3" diameter Plastic Plate and standard phillips head fastener used for insulation attachment into steel or wood decks. Installed using Olympic Fastening Tools.
 - 2. CI Term Bar Nail-Ins: A 1-1/4" long expansion anchor with a zinc plated steel drive pin used for fastening the Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.
 - 3. Seam Fastening Plates: a 2 inch diameter metal plate used for additional membrane securement.
 - 4. Insulation Fastening Plates: a nominal 3 inch diameter plastic or metal plate used for insulation attachment.

2.6 Metal Edging and Membrane Terminations

Termination Bar: 1 inch wide and .098 inch thick extruded aluminum bar pre-punched 6 inches on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.

2.7 Other Materials

Metal Flashing, specified under Section 07621.

3.0 - EXECUTION

3.1 General

- A. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, job site

considerations and weather restrictions.

- B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

3.2 Insulation Placement and Attachment

- A. Install insulation or membrane underlayment over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch. Stagger joints horizontally and vertically if multiple layers are provided.
- B. Secure insulation to the substrate with the required insulation adhesive and manufacturer's specification to meet wind zone requirements (FM I-90) and 120 MPH wind speed at roof level.

3.3 Membrane Placement and Attachment

- A. Position membrane over the acceptable substrate. Fold membrane sheet back lengthwise (onto itself) so half the underside of the membrane is exposed.
- B. Apply Bonding Adhesive in accordance with the manufacturer's published instructions, to the exposed underside of the membrane and the corresponding substrate area. Do not apply Bonding Adhesive along the splice edge of the membrane to be hot air welded over the adjoining sheet. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
 - 1. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded section of the membrane sheet immediately after rolling the membrane into the adhesive with a soft bristle push broom to achieve maximum contact.
 - 2. Fold back the unbonded half of the sheet lengthwise and repeat the bonding procedures.
- C. Position adjoining sheets to allow a minimum overlap of 2 inches.
- D. Hot air weld the membrane sheets using the Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's hot air welding procedures.
- E. Pull the membrane back along the welded splice so the entire underside of the membrane is exposed once the Hot Air Weld has been completed.
- F. Apply Bonding Adhesive to the exposed underside of the membrane sheet and the substrate.
- G. Allow adhesive to dry until tacky and roll the membrane into the substrate and brush down the bonded section with a bristle broom following the procedure noted above.
- H. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously.

3.4 Membrane Splicing/Hot Air Welding Procedures

- A. Hot air weld the membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller to ensure a continuous hot air welded seam. (Note: When using .060" thick membrane, all splice intersections shall be overlaid with non-reinforced flashing)
- B. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes).
- C. Repair all seam deficiencies the same day they are discovered.
- D. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete. Cut Edge Sealant is not required on vertical splices.

3.5 Flashing

- A. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using reinforced membrane. Non-reinforced membrane can be used for flashing pipe penetrations, Sealant Pockets, and scuppers, as well as inside and outside corners, when the use of pre-molded accessories is not feasible.
- B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.6 Walkways

- A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the specifier's drawing.
- B. Hot air weld walkway pads to the membrane in accordance with the manufacturer's specifications.

3.7 Daily Seal

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Complete an acceptable membrane seal in accordance with the manufacturer's requirements.

3.8 Clean Up

- A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

END OF SECTION

CERTIFICATION OF ROOFING SYSTEM

Project: _____

Architect's Job No: _____ **DCM Project No.** _____

Owner: _____

General Contractor: _____

Roofing Subcontractor: _____

Roofing Material Manufacturer: _____

Roofing Material Manufacturer's Inspector: _____

The undersigned Contractors, Manufacturer Representative and Inspector do hereby state that the Roofing System for the Project identified above has been provided in compliance with all Codes specified and as required by Local and State of Alabama laws and regulations and has been provided in compliance with the specified Performance Requirements.

SIGNATURES

General Contractor: _____
Signature Printed Name

Roofing Subcontractor: _____
Signature Printed Name

The Roofing Material Manufacturer further states that the Roofing System Provided by Manufacturer to the Roofing Contractor complies with International Building Code 2015 for the County that Roofing System has been installed.

Roofing Material Manufacturer: _____
Signature Printed Name

The Roofing Material Manufacturer's Field Inspector certifies that he/she has made field inspections in the proper number and sequence to assure Roofing Material Manufacturer that the Roofing System supplied has been installed to comply with Manufacturer's installation requirements as well as the 2015 IBC.

Roofing Material Manufacturer's Inspector: _____
Signature Printed Name

SHEET METAL WORK FLASHING AND TRIM - SECTION 07621
(Baked Enamel Steel)

1.0 - GENERAL

1.1 Scope

The work under this section consists of all sheet metal work, including metal flashing, trim and roof drainage accessories.

1.2 Applicable Standards / Quality Assurance

- A. The workmanship and methods employed for forming, anchoring, joining, and measures for expansion and contraction of sheet metal work shall conform to the applicable details and standards as indicated in the "Architectural Sheet Metal Manual, 6th Addition" as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. and referred to as "The SMACNA Manual," unless other methods are indicated on the project drawings or specified herein.
- B. See Division 1 for required Pre-Roofing Conference.
- C. Prior to fabrication, verify field conditions and coordinate the work if this section with trades of adjoining work as required to provide a complete weathertight system consistent with roofing manufacturer's warranty requirements. The work of this section is subject to acceptance by the Roofing Material Manufacturer and Roofing Contractor. Verify the substrate to be sound, dry, properly sloped, clean, and secure prior to installation of sheet metal work.
- D. Workmanship shall be of best quality. Shop fabricate sheet metal components whenever possible without tool marks and oil-canning. The various sections shall be uniform and have true lines. The joints at corners, angles and different sections shall be accurately fitted and rigidly secured. Exposed edges are to be folded back, joints are to be flat lock seamed and soldered, expansion is to be provided for in long run work. Provide materials of this section and installation to promote longevity and prevent water infiltration.
- E. Galvanic action shall be prevented where two different metals are joined together. Use bitumastic coating or other approved method.
- F. Sheet Metal and Flashing / Trim shall be provided in thickness or weight to withstand wind loads according to zone (but in no case less than 90 MPH winds), thermal movement and building movement as required to avoid compromise of quality. Roof edge flashing components shall meet or exceed recommendations of FMG Loss Prevention Data Sheet 1-49.
- G. Comply with the following material and finish standards: ASTM D 2244-68, ASTM D 659-74, ASTM A 653/A 653M, ASTM A 755/A 755M, ASTM A 792/A 792M, ASTM C 1311 and ASTM D 4586

1.3 Related Documents

Drawings and Division 1 of the Specifications

1.4 Handling and Storage

Sheet metal items shall be carefully handled to prevent damage and shall be stored above the ground in a covered dry location. Damaged items that cannot be restored to a like new condition will be rejected and shall be replaced. Materials shall not be stored on the roof.

1.5 Verifying Dimensions

The contractor shall verify governing dimensions at the building and examine adjoining work on which sheet metal is dependent for installation according to the intent of this specification.

1.6 Examination of Surfaces

The contractor shall examine all surfaces to be covered with sheet metal, shall report any defective surfaces to the architect, and shall not begin work until the defective surfaces have been corrected.

1.7 Submittals and Samples

A. Submit product data, color charts and samples with intended factory finish and profiles of each product as detailed in SECTION 01350.

B. Submit Shop Drawings with plan layouts, elevations and enlarged construction details of each applicable roof condition, identified and shown with dimensions, profiles and relationship to adjoining components and materials. Indicate the following as applicable: gauge, weight, thickness, fastening, joining, support, anchoring, expansion measures, etc.

2.0 - PRODUCTS

2.1 Sheet Metal Materials

A. Zinc-Coated (Galvanized) Steel Sheet -G90 (Z275) coated, structural quality. (minimum 24 ga.)

B. Factory Finished Baked Enamel Aluminum-Zinc-Coated (Galvalume) Steel Sheet, Class AZ50 coating designation Grade 40, Class AZM150 coating designation Grade 275.

1. Material shall be minimum 24 ga. approved equal to "MBCI Batten-Lock", "AMS Lock-Seam" or "AEP-SPAN Span-Lock" with factory sealant and striations.

2. Factory finish shall be approved equal to KYNAR 500. Color to be selected by the Architect through the submittal process.

2.2 Underlayment

Cold applied, self-adhering elastomeric sheet 30 mils minimum thickness with releasable paper backing. Install as per manufacturer's recommendations.

2.3 Sealing Materials

A. Sealant shall be elastomeric polyurethane polymer as recommended by manufacturer for use with the work of this section for a finished weathertight installation.

B. Elastic Sealing Tape with releasable paper backing shall be provided as recommended by manufacture for use with the work of this section for a permanent weathertight installation.

C. Asphalt Roofing Cement shall be asbestos free and comply with ASTM D 4586 and used only as recommended by manufacture for use with the work of this section for a finished weathertight installation.

D. Butyl Sealant shall comply with ASTM C 1311 and used only as recommended by manufacture for use with the work of this section for a finished weathertight

installation.

- E. Bituminous Asphalt Mastic, cold applied, shall be asbestos free and used only as recommended by manufacture for use with the work of this section for a finished weathertight installation.

2.4 Fastening

- A. Unless indicated otherwise, fastening system shall be concealed with cleats for expansion / contraction abilities, at exposed visible finished flashing and trim.
- B. Nails, self-tapping screws, bolts, rivets, and other fastenings for sheet metal shall be of the size and type suitable for the intended use. Exposed fasteners shall match contacted sheet metal finish.

2.5 Sheet Metal Work - Roof Drainage Accessories and Fabricated Components

- A. Gravel guards, high and low; Counter Flashing; Flashing Receivers; Eave and Rake Flashing and Equipment Support Flashing as indicated and/or required shall be fabricated from prefinished 24-gauge sheet metal material.
- B. Fascias and/or Coping to shape indicated and/or required. shall be fabricated from prefinished 24-gauge sheet metal material and attach continuously with 20 gauge concealed cleats.
- C. Gutters shall be fabricated per sectional profile as indicated with factory pre-finished sheet metal material of thickness as necessary to structurally support weight of rain water loading according to manufactures calculation charts; but in no case less than 24 gauge. Gutter shall be provided in maximum lengths, not less than 8'-0" . Support gutter with 1 1/4" wide x 16 gauge straps of matching material at 30" max. o.c. Provide the following fabricated gutter accessories as required: sealed outlet tubes, ends, expansion joint covers, etc. of matching material. Gutter Expansion Joints shall be provided 50'-0" o.c. maximum.
- D. Downspouts, shall be fabricated rectangular in sectional profile with factory pre-finished sheet metal material of thickness as necessary to structurally support weight of rain water loading according to manufactures calculation charts; but in no case less than 24 gauge. Neatly miter all angled joints & elbows. Provide the following fabricated downspout accessories as required: 16-gauge x 1 1/4" wide hanger straps of matching material w/ anchor fasteners, minimum three per downspout; precast concrete splash blocks; 24 gauge fabricated splash pans, etc.
- E. Downspout strainers shall be installed in top of each downspout. Metal strainers shall be 1/2" woven mesh not less than 4" high and extend full coverage into downspout.
- F. Boots where indicated - Downspouts boots shall be PVC Boots to fit and transition from rectangular downspout sections to round underground pipe sections.

2.6 Miscellaneous Sheet Metal Work

Sheet metal items not covered elsewhere in this section shall be as indicated on the drawings and as required to form a watertight installation. Profiles, bends, and intersections shall be sharp, even, and true. Joints shall be locked, or lapped and soldered, as applicable.

- A. Metal Flashing and Counter Flashing exposed to view. Fabricate and install in

accordance with related work manufacturer's requirements.

1. Flashing for all projections through walls and/or roof which are not furnished under other sections.
2. Metal flashing for equipment specified under Plumbing, Mechanical, and/or Electrical Sections, projecting through the walls and/or roof shall be furnished under the respective sections and accepted / installed under this section.

B. Accessories

All accessories or other items essential to completeness of sheet metal installation, though not specifically shown or specified, shall be provided compatible with comparable material specified.

2.7 Plumbing Vent Flashing

All plumbing stacks projecting through the roof shall be flashed appropriately according to compatibility with roofing system with either: 3 lb. lead flashing extending up plumbing vent stack and turned down into vent stack (minimum 1") or prefabricate Deck-tight as approved by the roofing system manufacturer.

2.8 Project Identification Plaque

Provide an engraved aluminum plaque, nominal 4"x 6" x 1/8" thick, with information pertinent to the project including the following: Date of roofing installation, Roofing Manufacturer, Contractor, Architect, Roofing Product, Warranty period, etc.

3.0 - EXECUTION

3.1 General

- A. All sheet metal work, including but not limited to: flashing, counter flashing, gravel stops, post / pipe flashing, fascia, trim flashing, rake flashing, gutters, downpipes, scuppers, pans, etc. shall be quality installed as required and/or indicated on the drawings for a complete weathertight system.
- B. Surfaces to which sheet metal is applied shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application or appearance.
- C. Materials furnished under this section which are to be built in by others shall be delivered to the site in time to avoid delays to construction progress.
- D. All cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed under this section. Torch cutting or abrasive saw cutting shall not be allowed.
- E. Where sheet metal is in contact with dissimilar metals, mortar, concrete or masonry materials, the dissimilar surfaces shall be kept from direct contact by painting the contact surfaces with a coating of an approved bitumastic compound. Sheet metal in contact with treated wood shall have an underlayment backing of waterproof membrane for contact separation.
- F. Plumbing vents roof penetrations shall be located and provided by the Roofing Contractor in coordination with the Plumbing Contractor.

- A. Fabricate and install sheet metal with lines, arises, and angles sharp and true and plane surfaces free from wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form a 1/2" wide hem on the side concealed from view. Finished work shall be free from water leakage under all weather conditions.
- B. All items shall be fabricated in maximum lengths. All joints shall be held to a minimum and spaced symmetrical. Joints shall be neatly sealed with an elastomeric sealant to achieve weathertightness.

3.3 Expansion

All sheet metal work shall be so designed and anchored that the work will not be "oil-can" distorted nor the fastenings seriously stressed from expansion and contraction of the metal.

3.4 Installation

- A. This contractor shall cooperate and coordinate with other trades in the correct placing of anchorage and the preparation of surfaces which are to receive sheet metal work. Any defects in the work of other trades shall be reported to the architect. The beginning of installation work by this contractor shall indicate his acceptance of adjoining work.
- B. All sheet metal work shall be set level and to true planes as indicated on the drawings and installed as intended in a first quality manner according to standards of SMACNA and industry standards for a complete watertight flashing system.
- C. Anchor bolt or screws used to secure the work to other materials or at expansion joint covers shall be tightened sufficiently to properly secure the work and still permit expansion and contraction of the assembly.
- D. Install roof drainage accessories as required for a complete watertight roof drainage system according to the standards of SMACNA.

Gutters

- 1. Gutters shall be installed to slope to downspouts
- 2. Gutter joints shall be lapped, riveted and soldered and sealed with elastomeric sealant to prevent leaking.
- 3. Provide expansion joint with back-to-back sealed end closures not to exceed 50' o.c. and joint caps to lap 4" minimum.
- 4. Anchor gutter sections at upper limits to eave or fascia with straps to support outer limits at 30" o.c. max.
- 5. Provide gutters with sealed end closures.

Downspouts

- 1. Provide sealed outlet tube at connection to gutter.
- 2. Provide 1 1/2" telescoping section joints
- 3. Provide Fastener straps to secure downspout to and 1" off of the wall at approximately 48" o.c.
- 4. Provide turn-out elbows where indicated to direct water away from the building base onto splash blocks on grade or splash pans on adjacent roof surface. Splash pans shall be set in elastomeric sealant. Provide strait boot connection where boots are indicated to direct water into below ground storm drainage.
- 5. Coordinate location of downspouts with architectural building elevation drawings; contact the Architect if conflicts occur.
- 6. Minimum size 4" x 5"

- E. Utilize appropriate fasteners to penetrate substrate as follows: 1 ¼" minimum for nails and ¾" minimum for screws. Fasteners into treated wood shall be stainless steel.
 - 1. Fasten roof edge flashing per recommendation of FMG Loss Prevention Data Sheet 1-49 according to zone but space not more than 4" o.c. staggered.
 - 2. Bottom limits of roof edge flashing shall be provided with interlocked continuous cleats fastened to substrate 12" o.c.
- F. Pipe / Post Flashing shall be wrap-around umbrella type with tightened s.s. draw band and flared upper edge with sealant fill to achieve minimum 5" of coverage at pipe / post perimeter.
- G. Permanently attach the Project Identification Plaque where readily visible from the roof and in immediate proximity of the work of this project.

3.5 Roof Flashing Installation

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, NRCA's "Roofing and Waterproofing Manual" and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and no less than 4" on center staggered.
 - 1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 12" centers through the vertical leg face.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of roof flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over counter flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant.
 - 1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant; interlocking folded seam or blind rivets and sealant as indicated.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof.

3.6 Wall Flashing Installation

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Reglets: Saw-cut reglets a minimum of one (1") inch deep by one quarter (¼") inch wide into masonry substrate/wall at locations indicated.

3.7 Miscellaneous Flashing Installation

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 Cleaning and Protection

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. After installation is completed, all sheet metal work shall be cleaned with solution recommended by Metal Manufacturers. Refinish metal where necessary, replace damaged parts, and leave in complete and finished condition.

3.9 Warranty

- A. Provide Manufacturer's Standard Twenty (20) Year Finish Warranty to support factory finish shall not chalk, peel, crack, fade or change in color in excess of 2 NBS units as per ASTM D 2244-68.
- B. The work of this section shall be concurrently covered under the "General Contractor's Five (5) Year Roofing Guarantee" as required by the State of Alabama per Division 1.

END OF SECTION

SECTION 07700 – ROOF EXPANSION JOINT TIE-IN SYSTEM

1.0 - GENERAL

1.1 Scope of Work

- A. Provide factory fabricated elastomeric waterproof tie in joint, to connect two incompatible roof systems as indicated on the architects/engineers drawings. All items in this section shall be furnished by, and be the responsibility of, the roofing/waterproofing contractor.

- 1. BUR Tie in Detail

- B. Roofing System Description

- 1. Modified Bituminous Membrane Roofing – Hot Applied

1.2 Related Sections

- A. Section 06100 - Rough Carpentry
- B. Section 07520 – Modified Bituminous Membrane Roofing - Hot Applied
- C. Section 07621 - Sheet Metal Flashing and Trim.

1.3 References

- A. Bituminous Materials
 - 1. ASTM D 312, Asphalt Used in Bitumen Type [III]
 - 2. ASTM D 41, Asphalt Primer Used in Roofing, Damp proofing and Waterproofing.
 - 3. ASTM D 4586 Type [II], Asphalt Roof Cement, Asbestos Free.

1.4 Submittals

- A. Submit product data under the applicable provisions of Section 01350.
- B. Submit manufacturer's installation instructions, product literature and specifications.
- C. Submit to tie in joint manufacturer drawings indicating location of tie in and configuration. In relation to adjacent work.

1.5 Quality Assurance

- A. Applicator Specializing in Roofing and certified by the Manufacturer to install work of this section in conjunction with the work of Section 07520 for a complete weathertight system.
- B. Independent Inspector as appointed by Owner.

1.6 Delivery, Storage and Handling

- A. Store products in accordance with manufacturer's instructions in weather protected environment, clear of ground and moisture.

- B. Keep the Redline Tie-in material dry and free of debris.

1.7 Warranty

- A. Provide manufacturer's highest quality warranty for a minimum of 20 years.

2.0 - PRODUCTS

2.1 Description

- A. Redline Tie-in joint is a flat, zero profile, tie-in joint waterproofing system that is used to join two incompatible roof membrane systems e.g. BUR/ Modified Bitumen, etc. The Redline joint waterproofing system is installed in a matter of minutes, and incorporates the site specific prefabricated details. The flat profile of the tie in does not obstruct the flow of water. The Redline material is joined by vulcanization. Specific shapes are manufactured and joined together to form a monolithic waterproof tie in joint material.

2.2 Material Characteristics

- A. Redline material is an extruded elastomer with polyester fleece embedded on one side, (top and bottom surfaces). It is resistant to the effects of UV, ozone, high temperatures, and chemicals such as; alkalis, acids, saline solutions, alcohol and ketones. The high quality and purity of the elastomer makes vulcanization of the tie-in joint pieces possible. Vulcanization allows the construction of details around unique shapes without the use of glue, caulking or tape.

2.3 Material

- A. Appearance - Color: Orange-red with white fleece edging on the salvage edge.
- B. Material Chemistry
 - 1. Redline base material an elastomer with a saturated polymethylene chain.
 - 2. Polyester fleece: 0.60 oz/ft² [200 g/m²].
- C. Redline Tie-in joint waterproofing material, complies with the following minimum physical performance specifications:
 - 1. Hardness Durometer A to ASTM D 2240: 45 ± 5
 - 2. Elongation at break to ASTM D 412: 500 %
 - 3. Low temperature flex to ASTM D 746: -70 °F [- 56.7 °C]
 - 4. Tear resistance to ASTM D 624 (Die C): 220 lbf/in [38.8 N/mm] min.
 - 5. Resistance to heat aging, 7 days @ 250 °F [121 °C], change in hardness: 10% max.
 - 6. Resistance to heat aging, 7 days @ 250 °F [121 °C], change in tensile strength: 10% max.
 - 7. Resistance to heat aging, 7 days @ 250 °F [121 °C], change in elongation: 10% max.

8. Resistance to oil aging, change in volume after 72 hours, immersion in ASTM Oil #3 @ 212 °F [100 °C]: +100 % max.
 9. Resistance to ozone, to ASTM D 1149: No cracks.
 10. Change in weight to ASTM D 471: less than 2 %
 11. Seam tensile strength to ASTM D 816: Same as base material.
 12. Water vapor permeability to ASTM E 96 Method B: less than 2.0 perms [114.9 ng/Pa s m²] max.
 13. Puncture test - cone to CGSB 37.56 M (1995): 10 lbs. [44.5 N] min.
 14. Embedment of fleece covered flaps in Type II or III asphalt according to CGSB 37.56 M (1995): 23 lbs/in [4.0 N/mm] min.
 15. 2000 hours exposure to UV to ASTM G 53: No cracks or crazing.
- D. Redline Tie-in joint waterproofing system is supplied by SITURA INC., 1-888-4-SITURA (1-888-474-8872).

Redline Tie-in

Geometry:		
Thickness:	118 mil	[3.0 mm]
Width:	22"	[540 mm]
Salvage Edge Dimension:	6"	[150 mm]

2.4 Adhesive Material

Use a self curing structural adhesive as approved by Roof Tie-in manufacturer.

3.0 - EXECUTION

3.1 Pre-Installation Conference

- A. Convene a pre-installation conference prior to commencing work of this section in conjunction with Pre-Roofing Conference. Require attendance of installer, Contractor, Architect, Owner, Alabama Building Commission, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, testing agencies and governing authorities. Objectives of conference include:
1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
 2. Review roofing system requirements (drawings, specifications and other contract documents).
 3. Review required submittals both completed and yet to be completed.
 4. Review construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 5. Review required inspection, testing, certifying and material usage accounting procedures.
 6. Discuss weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
 7. Record discussion of conference including decisions and agreements (or disagreements) reached and furnish copy of record to each party attending. If substantial disagreements exist

at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

- B. Review installation procedures and coordination required with related work, sequencing and scheduling.
- C. Environmental Requirements:
 - 1. Do not apply the Redline Tie-in joint waterproofing system during inclement weather.
 - 2. Do not apply the Redline Tie-in joint waterproofing system to a damp or frozen surface.
 - 3. Observe all the installation requirements of the manufacturer.

3.2 Inspection

- A. Prior to the commencement of the Redline Tie-in joint installation, verify that all items affecting work of this section are in place and positioned correctly.
- B. Verify that the supplied Redline Tie-in joint system corresponds to the tie-in joint layout.
- C. Commencement of installation constitutes acceptance of existing conditions and of the custom supplied Redline material.

3.3 Preparation

- A. Examination
 - 1. Verify that surfaces and site conditions are ready to receive the installation of the Redline Tie-in joint waterproofing system.
 - 2. Verify that all prepared surfaces are ready to receive the Redline Tie-in are clean and smooth, free of depressions, irregularities, or projections.
 - 3. Start of work means installer accepts existing surfaces and substrate.

3.4 Installation - General

- A. Install components in accordance with manufacturer's installation instructions and conventional roofing/waterproofing practices.
- B. Coordinate the installation of components of this section with the installation of the waterproofing membrane.
- C. Coordinate the completion of flashing in and stripping the Redline Tie-in joint material as work progresses with the work of this section to ensure watertightness.
- D. The uninstalled Redline Tie-in joint material must be kept dry and clean at all times.

3.5 Redline Tie-In Bur Roof Side Installation

- A. Mop the base ply surface with hot asphalt/bitumen. Apply the asphalt/bitumen at a nominal uniform rate of 0.23 lbs/ft² [1.12 kg/m²]. Install each Redline Tie-in edging polyester fleece so that it shall be firmly and uniformly set, without voids, into the hot asphalt (within 25 °F [14 °C] of the EVT rating indicated on bitumen container label.) At all times observe the bitumen/asphalt manufacturer's recommendations. The Redline fleece must be completely encapsulated in the hot asphalt/bitumen.
- B. Apply the stripping plies smooth, free from air pockets, wrinkles, fishmouths, or tears. Coat the top surface of the Redline fleece with hot asphalt/bitumen. Apply the asphalt/bitumen at a nominal uniform rate of 0.23 lbs/ft² [1.12 kg/m²]. Install each stripping ply, shingle lap fashion, onto the Redline edged polyester fleece firmly and uniformly, without voids, into the hot asphalt (within 25 °F [14 °C] of the EVT rating indicated on bitumen container label.) The Redline fleece must be completely encapsulated in the hot asphalt/bitumen.
- C. Additional protection to the Redline Tie-in joint is optional but can be provided by attaching a modified bitumen sheet to the BUR roof side over the Redline Tie-in joint. This is achieved by either mopping or torching the modified bitumen sheet to the already installed BUR stripping ply(s).

3.6 Field Quality Control

- A. Field inspection will be performed under provisions of Contract Documents.
- B. Correct identified defects or irregularities.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work under this section consists of caulking and sealants.
- 1.2 Work Included
See the drawings for all items and places requiring caulking. Completely seal with specified caulking compound joints around door frame and frame base and window frames (inside and outside); all other openings in masonry, concrete, or precast concrete joints in or between precast concrete panels; beneath all exterior thresholds; around plumbing fixtures; all places indicated on the drawings to be caulked; and all other places where caulking is required, whether specifically shown on the drawings or not.
- 1.3 Submittals
Submit for approval product literature and samples of all materials proposed for use. Colors to be approved in the field by the Architect to match adjacent construction color.

2.0 - PRODUCTS

- 2.1 Sealant
 - A. Exterior sealant shall be a gun grade one part silicone compound. Materials shall be Tremco Spectrem 1, Dow Corning No. 790 or Pecora No. 890, color as selected.
 - B. Primer, if required, for the silicone sealant shall be a quick drying clean primer as recommended by the manufacturer of the material used.
- 2.2 Caulking
 - A. Interior caulking compound shall be a paintable, one part, gun grade butyl rubber base material equal to Tremco Tremflex 834 Acrylic, Pecora BC-158 or DAP Butyl Flex or acrylic latex base caulking compound equal to Pecora AC-20 or DAP Latex Caulk.
 - B. Floor Caulking compound shall be a tintable, semi-self leveling polyurethane base equal to Tremco THC900/901. Colors shall be selected by Architect from manufacturers entire line of colors.
- 2.3 Fire Caulking
All locations indicated and/or all penetrations or openings into fire barriers shall be sealed with fire caulk material meeting UL requirements for such application. Submit product literature indicating UL compliance for approval. All trades shall use same fire caulk product. Installer shall be certified by the manufacturer.
- 2.4 Compressible Joint Sealant
Sealant shall be compressible polyurethane foam impregnated with polybutylene, Polytite as manufactured by Polytite Manufacturing Corporation, or other material as approved.
- 2.5 Filler
Filler shall be polyethylene foam, polyurethane foam, untreated jute, pointing mortar or other oil-free materials subject to approval of the manufacturer of the caulking or sealant compound.

2.6 Accessories

- A. Bond breaker shall be polyethylene tape.
- B. Solvents, cleaning agents, and other accessory materials shall be as recommended by the sealant manufacturer.

3.0 - EXECUTION

3.1 Joint Preparation

- A. Joints deeper than 1/2" shall be built up to a depth of 3/8" below adjacent surfaces with approved filler material prior to applying sealant. All surfaces must be clean and dry. Any protective coating or foreign matter such as oil, dust, grease, dirt, or frost on building materials that will impair bond shall be removed. Masonry and concrete surfaces shall be sound. If required by manufacturer's instructions, apply brush coat of primer to surfaces and allow to dry before applying sealant.
- B. At the option of the applicator, the surfaces next to the joints may be masked to obtain a clean neat line. Remove tape immediately after tooling the sealant.

3.2 Application

- A. Caulking or sealant shall be used from manufacturer's original cartridge in a standard open type, hand operated caulking gun. Nozzle shall be cut to proper size to obtain a neat, smooth and uniform bead. When handling bulk material, manufacturer's instructions shall be followed.
- B. A full bead of caulking or sealant shall be applied into joint under sufficient pressure, drawing nozzle across caulking or sealant to leave a slightly concave surface. Tool with a caulking tool or soft bristled brush moistened with solvent within 10 minutes after exposure. All sealed joints shall be watertight.
- C. Joints shall be caulked before painting adjacent work. Do not paint over silicone sealant compound.
- D. Fire caulk shall be installed to comply with manufacturer's requirements, UL requirements, and requirements of authority having jurisdiction.

3.3 Clean-up

On non-porous surfaces, excess uncured caulking shall be immediately removed with a solvent moistened cloth. On porous surfaces, excess caulking should be allowed to cure overnight, then remove by lightly wire brushing or sanding. All adjacent surfaces shall be clean and free from stains.

END OF SECTION

HOLLOW METAL DOORS & FRAMES - SECTION 08110

1.0 - GENERAL

- 1.1 Scope
Furnish and install all hollow metal doors and frames including view windows, as indicated on the drawings and herein specified.
- 1.2 Submittals
 - A. Submit shop drawings for approval.
 - B. Drawings shall show a schedule of openings using architectural opening numbers, all dimensions, jamb and head conditions, construction details, preparations for hardware, gauges, and finish.
- 1.3 Templates
 - A. Manufacturer shall obtain templates of all applicable hardware from the Finish Hardware Contractor and make proper provision for the installation of this hardware.
 - B. Unless otherwise specified in the hardware section of the specifications, hardware locations shall be in accordance with the recommendations of The National Builder's Hardware Association.
- 1.4 Marking and Storage
Mark each frame for intended location. Store frames off the ground and in a manner to protect them from damage.
- 1.5 Storage
 - A. Doors shall be stored in a dry, secure location to prevent exposure to weather and/or moisture.
 - B. Frames shall be stored off the ground and protected from weather until in place.

2.0 - PRODUCTS

- 2.1 Door Construction
 - A. Exterior Doors: Formed up sheets not less than 16 U.S. gauge rigidly connected and reinforced inside with continuous interlocking 20-gauge hat stiffeners, spaced a maximum of 6" apart. Interior Doors: Formed up sheets not less than 18 U.S. gauge rigidly connected and reinforced inside with continuous interlocking 20-gauge hat stiffeners, spaced a maximum of 6" apart. Sound deadening material of rock wool batts, insulites or other standard recognized available sound deadening materials shall be placed between all stiffeners and plates. Honeycomb doors are not acceptable. Suitable provision shall be made to receive glass panels or louvers. Edge seams are to be continuously welded and ground smooth. Bondo seams are not acceptable.
 - B. Louvers for interior metal doors shall be of sizes and types as indicated, inverted "V" with metal frame overlapping the door face.
 - C. Louvers for exterior doors shall be of sizes and types as indicated, rainproof, 20 ga. galvanized steel. Provide No. 16 wire mesh screen at inside of louvers.
 - D. Doors and frames shall be equal to Steelcraft, Curries, Pioneer or approved equal.

- E. Doors shall be coordinated with thresholds specified under FINISH HARDWARE - SECTION 08710 to meet A.D.A. requirements. Doors shall be extended as required to seal against threshold.
- F. Non-full height doors such as Toilet Stall Doors shall be provided with an inverted filler cap channel at head to maintain smooth uniformity at top of door surface.
- G. Hollow metal doors shall be provided with beveled hinge and lock edges. Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm).
- H. Exterior door face sheets shall be galvanized steel, level A60 (ASTM A653).
- I. Hardware preparation for hollow metal doors: hinge reinforcements shall be minimum 7-gauge x 9" length.
- J. Hardware Reinforcements:
 - 1. Hinge reinforcements for full mortise hinges: minimum 7 gage [0.180" (4.7mm)].
 - 2. Lock reinforcements : minimum 16 gage [0.053" (1.3mm)].
 - 3. Closer reinforcements : minimum 14 gage [0.067" (1.7mm)], 20" long.
 - 4. Galvanized doors: include Galvanized hardware reinforcements. Include Galvanized components and internal reinforcements with Galvanized doors. Close tops of exterior swing-out doors to eliminate moisture penetration. Galvanized steel top caps are permitted.
 - 5. Projection welded hinge and lock reinforcements to the edge of the door.
 - 6. Provided adequate reinforcements for other hardware as required.
- K. Glass moldings and stops (both labeled and non-labeled doors):
 - 1. Fabricate glass trim from 24 gage [.6mm] steel conforming to:
 - a. Interior openings ASTM designation A 366 cold rolled steel.
 - b. Exterior openings ASTM designation A 924 Zinc-Iron Alloy-Coated Galvanized steel with a zinc coating of 0.06 ounces per square foot (A60) for exterior openings.
 - 1) Install trim into the door as a four-sided welded assembly with mitered, reinforced and welded corners.
 - 2) Trim: identical on both sides of the door.
 - 3) Exposed fasteners are not permitted. Labeled and non-labeled doors: use the same trim.
 - 4) Acceptable mounting methods:

- a) Fit into a formed area of the door face, not extending beyond the door face, and interlocking into the recessed area.
- b) Cap the cutout not extend more than 1/16" [1.6mm] from the door face.

L. Electrical Requirements for Doors:

General: Coordinate electrical requirements for doors and frames. Make provisions for installation of electrical items arranged so that wiring can be readily removed and replaced.

1. Doors with Electric Hinges:

- a. General: Furnish conduit raceway to permit wiring from electric door hardware.
- b. Hinge Locations: Provide electric hinge at intermediate or center location. Top or bottom electric hinge locations are not acceptable.
- c. Refer to 08710 for electrified hardware items.

2.2 Frame Construction

- A. Frames shall be of sizes as indicated, completely assembled, buck and frame formed from 14-gauge exterior, 16-gauge interior, steel with 2" face unless otherwise indicated and 5/8", minimum, integral stop. Exterior frames and interior frames at cafeteria, kitchen, locker room and shower areas shall be Galvannealed A60 (ASTM A653).
- B. Corners of frames to be mitered and continuously welded. Joints shall be pulled up tight, welded, and ground smooth with faces in correct alignment.
- C. Provide adjustable "T" type anchors, three to each jamb; welded angle clips at bottom of frames for anchorage to floor construction; detachable type metal spreaders. Jamb anchors shall be T-shaped and of the same thickness as the metal of the frames. Where "T" anchors are not feasible, provide anchors as required and/or recommended.
- D. Machine frames for attachment of hardware, including special reinforcing for extra heavy duty use, drilling, and tapping. Provide mortar tight metal dust boxes in back of lock location.
- E. Frames for sidelights shall be integral with door frames; borrowed light window frames and other openings shall be as detailed.
- F. Prepare frames for rubber silencers, three for single swing door and two for each pair of doors.
- G. Frames not extending to the floor surface shall have a closed welded jamb bottom.
- H. **While in the shop and prior to shipping, all frames to be installed in masonry shall be thoroughly coated on the inside surface with a bituminous water resistant paint.**
- I. Electrical Requirements for Frames:

1. General: Coordination all electrical requirements for doors and frames. Make provisions for installation of electrical items arranged so that wiring can be readily removed and replaced.
 - a. Provide cutouts and reinforcements required for metal door frame to accept electric components.
 - b. Frame with Electrical Hinges: Weld UL listed grout guard cover box welded over center hinge reinforcing. Top or bottom hinge locations are not permitted. Contractor to reference 3.01.E, for continuous hinges.
 - c. Provide cutouts and reinforcements required to accept security system components.
 - d. Refer to 08710 for electrified hardware items.
2. Provide mortar box, welded in head of door frame at exterior frames for future door contact switch provided by Owner. Size, type, location and conduit requirements to be provided by Owner.

2.3 Labeled Assemblies

- A. All openings shall be protected by assemblies which include doors, frames, hardware, closing devices, anchorage, sills, etc. installed in accordance with NFPA Standard "FIRE DOORS and WINDOWS, NFPA 80," as per Standard Building Code.
- B. To further clarify the basic requirements and/or the correct method of labeling that will be acceptable; the labels will include, but not be limited to, the following:
 1. Location - Each component shall bear an embossed label located so as to be accessible after installation.
 2. Permanence - Each component shall bear an embossed label of a type of material and be so attached that the life of the label and the attachment thereof can reasonably be expected to equal the life of the component to which it is attached.
 3. Legibility - The embossed label design shall be such that it can be visible and legible at all times and must be clean of any paint or other coverage making the label illegible! Rating shall be indicated in minutes.
 4. Other Requirements - As directed by the approved laboratory or organization providing testing and follow-up services and labeling.

2.4 Finish

- A. Metal doors and frames shall be thoroughly cleaned of dirt, grease, and impurities and shall be bonderized and finished with one coat of baked-on primer ready to receive finish paint.
- B. Primer shall be manufacturer's standard in accordance with ASTM B117.
Do not prime paint labels.
- C. Final painting as specified and applied under Painting Section.

3.0 - EXECUTION

3.1 Installation

- A. VERIFY THAT ALL FRAMES TO BE INSTALLED IN MASONRY HAVE BEEN COATED WITH A BITUMINOUS WATER RESISTANT PAINT IMMEDIATELY PRIOR TO INSTALLATION.
- B. Install frames plumb, rigid, and in true alignment; properly brace until built in. Set spreader and attached jambs to floor through floor anchors.
- C. In masonry openings, where required, install a second spreader at the mid-height of the door opening, and do not remove until the masonry jambs are in place. Spreader shall be notched wood of approximate jamb width and 1" minimum thickness. Install a minimum of three anchors per jamb to be imbedded in masonry joint as the wall is laid up.
- D. Frames shall be grouted solid.
- E. Doors shall be rigidly secured in frames, hardware applied, and adjusted to achieve smooth operation without forcing or binding. Doors shall be capable of maintaining any degree of opening.

3.2 Protection

After installation, doors and frames shall be protected from damage during subsequent construction activities. Damaged doors and frames shall be replaced.

END OF SECTION

FIRE-RATED ALUMINUM FULL VISION DOORS AND FRAMES - SECTION 08120

1.0 - GENERAL

1.1 Section Includes

- A. Fire-rated aluminum full vision Aluflam door system including pre-finished door, frame, glazing, and hardware.

1.2 Related Sections

Section 08710 - Finish Hardware.

1.3 References

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E2010 Standard Test Method for Positive Pressure Fire Tests of Door Assemblies.
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Standard for Fire Doors and Fire Windows.
 - 2. NFPA 251: Standard Methods of Tests of Fire Endurance of Building Construction and Materials.
 - 3. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
- C. Uniform Building Code (UBC):
 - 1. UBC-7-4: Methods for Fire Tests of Door Assemblies.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. UL 10C: Positive Pressure Fire Tests of Door Assemblies.
- E. Standard Council of Canada:
 - 1. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
- F. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.
- G. Consumer Product Safety Commission (CPSC):
 - 1. CPSC 16 CFR 1201 Categories I and II: Safety Standard for Glazing Materials.

1.4 System Description

- A. System Performance Requirements:
 - 1. Fire Rating: 90 minutes.
 - 2. Certification: Doors and Frames shall be tested in accordance with ASTM E 2074, NFPA 252, UBC 7-2, UL 10C, UL263, CAN4-S104.
 - 3. Testing Laboratory: Fire tests shall be conducted by an approved independent testing laboratory, similar to Underwriter's Laboratories, Inc.

1.5 Submittals

- A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section 01350.
 - 1. Shop Drawings: Submit shop drawings showing layouts, profiles and product components.
 - 2. Samples: Submit samples for finishes, colors and textures.
 - 3. Technical Information: Submit latest edition of manufacturer's product data providing product description, technical data and installation instructions.

1.6 Quality Assurance

- A. Listings and Labels:
Fire rated framing and glazing shall be under current follow-up services by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.7 Delivery, Storage And Handling

- A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Delivery: Deliver materials to specified destination in manufacturer's packaging undamaged, complete with installation instructions.
- C. Storage and Protection: Store off ground, under cover, protected from weather, direct sunlight, construction activities and at temperature conditions recommended by manufacturer, +10°F to +110°F.
- D. Handling: Protect materials and finish during handling and installation to prevent damage.

1.8 Project Conditions

- A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

2.0 - PRODUCTS

2.1 Fire-Rated Aluminum Full Vision Doors and Frames

- A. Manufacturer: Alufam North America
- B. Substitute Products shall be considered if submitted to the Architect with technical information at least 10 days prior to bid date. Approved substitute shall be acknowledged by the Architect via Addendum.

2.2 Materials – Aluminum Framing

- A. Frame construction: Integral structure and glazing stops from extruded and thermally broken aluminum profiles. Filled internally with cement composite material.

- B. Dimensions:
 - 1. Door framing face dimension: 2-½ inch
 - 2. Depth of door framing: 3-7/16 inch
 - 3. Door stile face dimension: 3-9/16 inch
 - 4. Door cross rail (if applicable): 3-9/16 inch
- C. Assembly: Frame corners assembled by means of crimped and bonded miter joints.
- D. Sealing: Framing system shall insulate against effects of fire, smoke, and heat transfer from either side. Perimeter of the framing system to the rough opening shall be firmly packed with mineral wool insulation.

2.3 Materials – Fire Resistant Glazing

- A. Interior Assemblies shall be glazed under this section with rated SGG Pyroswiss Extra fire resistant glazing material as manufactured by Vetrotech Saint-Gobain to comply with system rating required.
 - 1. Individual lites shall be permanently identified with a listing mark.
 - 2. Glazing material installed in "Hazardous Locations" (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
 - 3. Visible daylight transmission shall be a minimum of 81%. Glazing material shall be optically clear, colorless and free from unusual distortion.

2.4 Materials – Glazing and Assembly Accessories

- A. Fasteners: All fasteners, setting pads, and glazing clips, shall be stainless or zinc-plated steel.
- B. Glazing Accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant intumescent glazing tape. Ceramic setting blocks shall be placed between the metal setting pads and the glazing material. Setting pads and blocks provided by manufacturer.

2.5 Fabrication

- A. Door frames and door leaves shall be furnished pre-assembled. Door assemblies shall be field glazed.
- B. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall field verify and guarantee dimensions within required tolerance (+ - 1/8"). Obtain approved shop drawings prior to fabrication.

2.6 Pre-Finish

- A. Framing shall be chemically cleaned and pretreated, then paint finished on all exposed areas. Color: White by the manufacturer according to standard practices.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Slight variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

3.0 - EXECUTION

3.1 Examination

- A. Examine area to receive doors. Openings shall be plumb, square and within allowable tolerances. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 Installation

- A. Door installation shall be by a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings.

3.3 Cleaning

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Glass and frame should be cleaned using soft clean cloth, chamois leathers, sponges or soft paper. Use clean warm water with a mild detergent. Do not use detergent that contains either alkaline, acids or fluoride! Abrasive cleaning methods can damage surfaces! Clean prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

1.0 – GENERAL

1.1 Summary

A. Section Includes:

Work under this section comprises of furnishing solid core doors (wood veneer faces and hardboard/MDF) light frames, factory fitting and machining and factory finishing for fire labeled and non labeled wood doors.

B. Related Documents:

Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section.

C. Related Sections:

1. 06210 – Finish Carpentry
2. 08710 – Finish Hardware Schedule
3. 08110 – Hollow Metal Doors and Frames
4. 08120 – Fire Rated Aluminum Full Version Doors and Frames
5. 08810 – Glass Glazing
6. 09910 – Paint

1.2 References

A. Standards:

1. NFPA-80 – Fire Doors and Windows
2. NFPA-105 – Recommend Practice for Installation of Smoke Controlled Door Assemblies
3. WDMA I.S. 1A – Wood Door Manufacturer's Association, Flush Wood Door Performance Standards
4. UL10C - Standard for Positive Pressure Fire Tests of Door Assemblies

B. Codes:

1. NFPA-101 – Life Safety Code
2. IBC 2015 – International Building Code
3. ANSI-A117.1 – Accessible and Usable Buildings and Facilities.
4. ADA – Americans with Disabilities Act

1.3 Submittals

A. General Requirements:

Submit copies of the wood door shop drawings in accordance with Section 01350.

B. Product Data:

Submit shop drawings showing fabrication and installation of wood doors. Include details of door elevations, details of construction, location and installation requirements of door hardware.

C. Shop Drawings:

1. Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information:
 - a. Door core material.
 - b. Mortises and reinforcements.
 - c. Glazed and louvered openings and material.
 - d. Mounting locations of standard hardware.
 - e. Elevation drawings.

D. Samples:

1. Upon request submit the following samples:
 - a. Corner sections of doors approximately 8" x 10" with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required.
 - b. Factory finishes applied to actual door face materials, approximately 8" x 10" inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
 - c. Frames for light openings, 6" long, for each material, type, and finish required.
 - d. Louver blade and frame sections, 6 inches long, for each material and finish specified.

1.4 Quality Assurance

A. Substitutions:

All substitution requests must be submitted for Architectural approval at least 10 days prior to bid in accordance with Section 01360. Approval of products will be in written form via Addendum.

B. Manufacturer Qualifications

1. Manufacturer shall be a member in good standing of the Wood Door Manufacturer's Association (WDMA).
2. Wherever possible obtain wood doors from a single manufacturer to ensure uniformity in quality of appearance and construction. All material supplied for this project to conform to WDMA I.S. 1A-97 for premium grade wood doors.

C. Fire Rated Doors:

1. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with hardware and other door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
 - a. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.
 - b. For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

2. A physical label to be permanently affixed to the fire door at an authorized facility. Furthermore, all 45, 60, and 90 minute label fire doors are to have manufacturer's standard laminated stiles for improved screw holding and split resistance capability.
 - a. At stairwell enclosures and where otherwise indicated, provide doors that have a maximum transmitted temperature end point of not more than 250 deg F above ambient after 30 minutes of standard fire-test exposure

1.5 Delivery, Storage, And Handling

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Doors are to be shipped from manufacturer in individual polybags, and shall be inspected immediately upon arrival at jobsite for any damage or defects.
- B. Identify each door with individual opening numbers that correlate with designation system used on shop drawings and contract drawings for door, frames and hardware. Use only temporary, removable, or concealed markings.
- C. Do not deliver or install doors until building is enclosed and weather tight, wet-work is complete and dry, and HVAC system is operating and maintaining ambient temperature and relative humidity at occupancy level in storage and installation areas.

1.6 Warranty

- A. Warranties shall be in addition to, and not a limitation of other rights the owner may have under the contract documents.
- B. Submit written warranty on manufacturer's standard form signed by the manufacturer agreeing to replace or repair defective doors which have:
 1. Delamination in any degree.
 2. Warp or twist of 1/4" or more in any 3' x 6" x 7' plane of door face.
 3. Telegraphing of stile, rail or core through face to cause surface variation in excess of 1/100" in any 3" spans.
- C. Contractor shall replace or refinish doors where contractor's work contributed to rejection or voiding of manufacturer's warranty.
- D. Solid core interior doors shall be warranted for the life of their installation.

2.0 - PRODUCTS

2.1 Manufacturers

Subject to compliance with requirements, provide wood doors by one of the manufacturers as listed.

2.2 Fire Rated Doors

All fire rated doors shall be supplied to meet UL10C positive pressure standards for category "A" doors. All required intumescent seals shall be concealed into the edge of the door; frame applied intumescent seals are not acceptable.

2.3 Doors

A. Faces For Transparent Finish

1. Doors shall have premium grade A faces with manufacturer's standard five (5) ply construction; minimum 1/8" thick with stiles and rails bonded to the core.
2. Faces shall be minimum 1/50" at 12% moisture content thick after finish sanding.
 - a. Veneer Cut: Plain Sliced
 - b. Face Assembly: Book Match, Running Match
 - c. Veneer Species: Select White Birch
3. Exposed vertical edges shall be of the same species as the face material.
4. Doors shall have minimum 1" stiles on the hinge stile and 13/16" minimum on the lock stile; both stiles faces shall match the door veneer. Top and bottom rails shall be a minimum 13/16"; rails shall be mill option hardwood or structural composite lumber (SCL).

B. Faces For Opaque Finish

1. Faces shall be custom grade closed-grain hardwood of mill option, Hardboard or MDF; five (5) ply construction with stiles and rails bonded to the core.
 - a. Hardboard Faces: AHA A135.4, Class 1 (tempered) or Class 2 (standard).
 - b. MDF Faces: ANSI A208.2, Grade 150 or 160.
2. Exposed vertical edges shall be any closed-grain hardwood.
3. Doors shall have minimum 1" stiles on the hinge stile and 13/16" minimum on the lock stile; both stiles faces shall match the door veneer. Top and bottom rails shall be a minimum 13/16"; rails shall be mill option hardwood or structural composite lumber (SCL).

C. Non Rated And 20 Minute Doors

1. Supply particleboard core complying with WDMA I.S. 1A and ANSI-A208.1, Grade 1-LD, bonded to the door faces, stiles and rails using a Type I adhesive. Components are to be assembled to meet or exceed 20 minute fire door specifications for UL10C fire test requirements.
 - a. Algoma: Super Novodor / FD 1/3
 - b. Eggers: PC5 / PC5-20
 - c. Graham: GPD PC5 / GPD PC5-20
 - d. Marshfield: DPC-1 / DFP-20
 - e. VT Industries: 5502
2. Supply engineered core complying with WDMA I.S. 1A, bonded to door faces, stiles and rails using a Type I adhesive. Components are to be assembled to meet or exceed 20 minute fire door specifications for UL10c fire test requirements. Door shall meet or exceed WDMA I.S. 1A Extra Heavy Duty performance standards.

- a. Algoma: FGFW
- b. Eggers: SCL5 / SCL5-20
- c. Graham: GPD EC5 / GPD EC5-20
- d. Marshfield: DCL-1 / DCL-20
- e. VT Industries: 5508

3. Provide LSL Timberstrand blocking at particleboard-core doors as follows to preclude the use of thru-bolts:

- a. Provide 5" top-rail blocking, at doors indicated to have closers.
- b. Provide 5" mid-rail blocking, at doors indicated to have exit devices.

D. Fire Rated Doors Over 20 Minutes

1. Supply fire resistive composite mineral core construction to provide the fire rating indicated, boned to door faces, stiles and rails using a Type I adhesive. Components are to be assembled to meet or exceed fire door specifications for UL10C fire test requirements.

- a. Algoma: FD
- b. Eggers: FGP
- c. Graham: GPD FD5
- d. Marshfield: DFM
- e. VT Industries: 5545/5511

2. For mineral-core doors, provide composite blocking with improved screw holding capability approved for use in doors of fire ratings indicated as necessary to eliminate need for through-bolting hardware and as follows:

- a. Provide 5" top-rail blocking.
- b. Provide 4 1/2" x 10" lock blocks.
- c. Provide 5" mid-rail blocking, at doors indicated to have exit devices.

3. At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

2.4 Factory Finishing (To Be Selected By The Architect)

A. Finish all doors to receive a transparent finish at the factory as indicated below; field finish doors indicated to receive an opaque finish in accordance with Division 9, Finishes.

- 1. Grade: Premium
- 2. Finish: WDMA TR-6 catalyzed polyurethane.
- 3. Stain: Clear-coat only.
- 4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.

B. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

C. Finish doors using three (3) coats of water-clear 100% solids, modified acrylic urethane, cured immediately with ultra-violet light.

- D. Factory seal transparent finish doors on all six (6) sides using manufacturer's standard meeting these applications.

2.5 Light Frames

- A. Provide manufacturer's standard metal light frame formed of 0.048 inch thick cold-rolled steel sheet with baked-enamel or powder-coated finish approved for use in doors of non fire rated or fire rating indicated.

2.6 Fabrication

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.
- B. 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.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Pre-machine metal astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 - 1. Trim openings with moldings of material and profile indicated.

3.0 - EXECUTION

3.1 Examination

- A. Examine installed door frames before hanging doors.
 - 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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

- A. For hardware installation, see Division 8 Section "Finish Hardware."
- B. Install wood doors to comply with manufacturer's written instructions, referenced quality standard and as indicated.
- C. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- D. Align factory fitted doors in frames for uniform clearance at each edge.

3.3 Adjusting And Protecting

- A. Rehang or replace doors that do not swing or operate freely.
- B. Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work under this section consists of stainless-steel rolling door units.
- 1.2 Submittals
 - A. Submit shop drawings.
 - B. Shop drawings to include manufacturer's descriptive literature listing all components to be used.
- 1.3 Related Sections
 - A. Division One
 - B. Masonry
- 1.4 Manufacturers
CECO, Cornell, Kinnear Door, Overhead Door or approved equal.
- 1.5 Warranty
All doors shall be guaranteed for a period of one (1) year from the date of completion of erection and any part defective in material or workmanship will be replaced without charge to the Owner.

2.0 - PRODUCTS

- 2.1 Rolling Door and Frame Assembly
 - A. Manufacturer: Approved Equal to Cornell Iron Works, Inc., Underwriters Laboratories, Inc. (UL), ISO 9001:2008 Registered.
 - B. Substitutions: Reference Section 01360 Product Substitution Procedures.
- 2.2 Materials
 - A. Curtain:
 - 1. ESD10 Straight Pattern
 - a. Horizontal Rods: Solid 5/16 inch (8 mm) diameter, 5056 H32 aluminum alloy
 - 1) Vertical Spacing: 2 inches (50.8 mm) on center.
 - 2) Vertical Chains: Grommated aluminum links, 3/4 inch (19 mm) wide, positioned by E-rings on 6 inch (152.4 mm) centers. Provide double E-rings on horizontal bars on both sides of end chains to retain curtain in guides.
 - 3) Bottom Bar: 2 x 3-1/2 inch (50.8 x 88.9 mm) extruded aluminum tubular section reinforced with 3 x2 x 3/16 inch aluminum angle(s).
 - 4) Finish: to be selected by Architect.
 - B. Guides, Tube Mounted: Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide steel tubes, floor saddles and hardware as recommended by manufacturer to support grille.
 - 1. Finish – To be Selected by Architect
 - C. Counterbalance Shaft Assembly:

1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
 2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of grille to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
- D. Brackets: Fabricate from minimum 3/16 inch (4.76 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
1. Finish: Phosphate treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.
- E. Hood and Fascia: 0.040 inch (1.016 mm) aluminum with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
1. Finish: To be selected by Architect

2.3 Accessories

- A. Locking:
1. Keyed cylinder locking into both jambs operable from both sides of curtain with motor interlock cutout switches.
 2. Emergency Egress Lock: Key cylinder locking from public side, thumbturn cylinder locking from tenant side, locking into both jambs. Provide an additional security panel in curtain.

2.4 Operation

- A. Manual Operation

3.0 - EXECUTION

3.1 Installation

- A. The work shall be installed by mechanics skilled in the trade and under the supervision of an accredited or franchised representative of the manufacturer.
- B. Work shall be in accordance with the Architect's Drawings, and approved shop drawings, and shall provide for smooth and easy opening and closing of doors, tight fit against jambs, heads and sills and secure attachment to the work of other trades.

END OF SECTION

SECTION 08710 – FINISH HARDWARE HARDWARE

1.0 - 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. Continuous hinges
 - 3. Key control system
 - 4. Lock cylinders and keys
 - 5. Lock and latch sets
 - 6. Bolts
 - 7. Exit devices
 - 8. Push/Pull units
 - 9. Closers
 - 10. Overhead holders
 - 11. Miscellaneous door control devices
 - 12. Door trim units
 - 13. Protection plates
 - 14. Weatherstripping for exterior doors
 - 15. Astragals or meeting seals on pairs of doors
 - 16. Thresholds
- C. Related Sections: The following Sections contain requirements that relate to the following sections.
 - 1. Section 08110: Hollow Metal Doors and Frames
 - 2. Section 08210: Wood Doors
 - 3. Section 08420: Aluminum Entrances and Storefronts
 - 4. Section 08120: Fire Rated Glass and Framing Systems
- D. Products furnished but not installed under this Section to include:
 - 1. Cylinders for locks on entrance doors.
 - 2. Final replacement cores and keys to be installed by Owner.

1.3 References

- A. Standards of the following as referenced:
 - 1. American National Standards Institute (ANSI)
 - 2. Door and Hardware Institute (DHI)
 - 3. Factory Mutual (FM)
 - 4. National Fire Protection Association (NFPA)
 - 5. Underwriters' Laboratories, Inc. (UL)
 - a. UL 10C - Fire Tests Door Assemblies
 - 6. Warnock Hersey
- B. Regulatory standards of the following as referenced:
 - 1. Department of Justice, Office of the Attorney General, *Americans with*

2. *CABO/ANSI A117.1: Providing Accessibility and Usability for Physically Handicapped People, 2010 edition.*

1.4 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. For items other than those scheduled in the "Headings" of Section 3, provide catalog information for the specified items and for those submitted.
- C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format "hardware sets" indicating complete designations of every item required for each door or opening. Use specification heading numbers with any variations suffixed a, b, etc. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.
 - i. Cross-reference numbers used within schedule deviating from those specified.
 - 1) Column 1: State specified item and manufacturer.
 - 2) Column 2: State prior approved substituted item and its manufacturer.
 2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
 3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- D. Provide samples if requested of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.
1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.
- E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- F. Contract closeout submittals:
 - 1. Operation and maintenance data: Complete information for installed door hardware.
 - 2. Warranty: Completed and executed warranty forms.

1.5 Quality Assurance

- A. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.
 - 1. 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 supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who is available for consultation to Owner, Architect, and Contractor, at reasonable times during the course of the Work.
- B. Coordination Meetings:
 - 1. Contractor to set up and attend the following:
 - a. Lock distributor to meet with the Owner to finalize lock functions and keying requirements and to obtain final instructions in writing.
 - b. Lock distributor and lock, closer and exit device manufacturer to meet with the installer prior to beginning of installation of door hardware. Instruct installer on proper installation of specified products.
- C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 requirements of authorities having jurisdiction.
 - 1. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not. All hardware to comply with State and local codes and UL 10C.
 - 2. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- D. All hardware is to comply with Federal and State Handicap laws.
- E. Substitutions: Request for substitutions of items of hardware other than those listed as "acceptable and approved" shall be made to the architect in writing no later than fourteen (14) days prior to bid opening. Approval of substitutions will only be given in writing by Addenda. Requests for substitutions shall be accompanied by samples and/or detailed information for each manufacturer of each product showing design, functions, material thickness and any other pertinent information needed to compare your product with that specified. Lack of this information will result in a refusal.

1.6 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.

1.7 Warranty

- A. Special warranties:
 - 1. Door Closers: Thirty-year period
 - 2. Locks and Cylinders: Three-year period
 - 3. Exit Devices: Two-year period

1.8 Maintenance

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions that are packed in hardware items for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

2.0 - PRODUCTS

2.1 Manufactured Units

(*Denotes preferred manufacturer)

- A. Hinges:
 - 1. Acceptable manufacturers:
 - a. Ives*
 - b. Bommer
 - c. McKinney
 - 2. Characteristics:
 - a. Templates: Provide only template-produced units.
 - b. Screws: Provide Phillips flat-head screws complying with the following requirements:
 - 1) For metal doors and frames install machine screws into drilled and tapped holes.
 - 2) For wood doors and frames install threaded-to-the-head wood screws.
 - 3) For fire-rated wood doors install #12 x 1-1/4 inch, threaded-to-the-head steel wood screws.
 - 4) Finish screw heads to match surface of hinges or pivots.
 - c. Hinge pins: Except as otherwise indicated, provide hinge pins as follows:
 - 1) Out-Swing Exterior Doors: Non-removable pins.
 - 2) Out-Swing Corridor Doors with Locks: Non-removable pins.
 - 3) Interior Doors: Non-rising pins.
 - 4) Tips: Flat button and matching plug. Finished to match leafs.
 - d. Size: Size hinges in accordance with specified manufacturer's

- published recommendations.
 - e. Quantity: Furnish one pair of hinges for all doors up to 5'-0" high. Furnish one hinge for each additional 2-1/2 feet or fraction thereof, unless otherwise specified in Hardware Headings.
- B. Continuous Hinges:
 - 1. Acceptable manufacturers:
 - a. Ives*
 - b. Select Products
 - c. Markar
 - 2. Characteristics:
 - a. Continuous gear hinges to be manufactured of extruded 6063-T6 aluminum alloy with anodized finish, or factory painted finish as scheduled.
 - b. All hinges are to be manufactured to template. Uncut hinges to be non-handed and to be a pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising.
 - c. Vertical door loads to be carried on chemically lubricated polyacetal thrust bearings. The door and frame leaves to be continually geared together for the entire hinge length and secured with a full cover channel. Hinge to operate to a full 180°.
 - d. Hinges to be milled, anodized and assembled in matching pairs. Fasteners supplied to be steel self-drilling, self-tapping 12-24 x 3/4" screws.
 - e. Provide UL listed continuous hinges at fire doors. Continuous hinges at fire doors (suffix -FR) to meet the required ratings without the use of auxiliary fused pins or studs.
- C. Cylinders:
 - 1. Acceptable manufacturers:
 - a. Match existing keying system
 - 2. Characteristics:
 - a. Except as otherwise indicated, provide new master key system for project.
 - b. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
 - c. 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.
 - 1) Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE".
 - d. Key Material: Provide keys of nickel silver only.
 - e. Key Quantity: Furnish (3) change keys for each lock, (5) master keys for each master system, (5) grandmaster keys for each grandmaster system, (10) construction master keys, (2) construction Control Keys.
 - 1) Furnish one extra blank for each lock.
 - 2) Furnish construction master keys to General Contractor.
 - 3) Deliver keys to Owner.
- D. Mortise Locksets and Latchsets: as scheduled.
 - 1. Acceptable manufacturers:

- a. Schlage L9000 Series*
- b. Sargent 8200 Series
- c. Corbin Russwin ML2000
- 2. Required Features:
 - a. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
 - b. Latchbolts: 3/4-inch throw stainless steel anti-friction type.
 - c. Lever Trim: Through-bolted, accessible design, cast or solid rod lever as scheduled. Spindles: Independent break-away.
 - d. Thumbturns: Accessible design not requiring pinching or twisting motions to operate.
 - e. Deadbolts: Stainless steel 1-inch throw.
 - f. Strikes: 16 gage curved stainless steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
 - g. Scheduled Lock Series and Design: Schlage L series, match existing lever design.
 - h. Certifications:
 - 1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
 - 2) ANSI/ASTM F476-84 Grade 30 UL Listed.

E. Exit Devices:

- 1. Acceptable manufacturers:
 - a. Von Duprin 98 Series*
 - b. Precision Apex 2100
- 2. Characteristics:
 - a. Exit devices to be UL Listed for life safety. Exit devices for fire rated openings to have "UL" labels for "Fire Exit Hardware."
 - b. Exit devices mounted on labeled wood doors to be mounted on the door per the door manufacturer's requirements.
 - c. All trim to be thru-bolted to the lock stile case.
 - d. Lever trim to be solid case material with a break-away feature to limit damage to the unit from vandalism. Lever design to match locksets.
 - e. All exit devices to be made of brass, bronze, stainless steel, or aluminum material, powder coated, anodized, or plated to the standard architectural finishes to match the balance of the door hardware.
 - f. Provide glass bead conversion kits to shim exit devices on doors with raised glass beads.
 - g. All exit devices to be one manufacturer. No deviation will be considered.
 - h. All series exit devices to incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. All exit devices to be non-handed. Touchpad to extend a minimum of 1/2 of the door width and to extend to the height of the cross rail housing for a "no pinch" operation. Plastic touchpads are not acceptable. All latchbolts to be the deadlocking type. Latchbolts to have a self-lubricating coating to reduce wear. Plated or plastic coated latchbolts are not acceptable. Plastic linkage and "dogging" components are not acceptable.
 - i. Surface vertical rod devices to be UL labeled for fire door applications without the use of bottom rod assemblies. Where bottom rods are required for security applications, the devices to

be UL labeled for fire doors applications with rod and latch guards by the device manufacturer.

- j. Exit devices to include impact resistant, flush mounted end cap design to avoid damage due to carts and other heavy objects passing through an opening. End cap to be of heavy-duty metal alloy construction and provide horizontal adjustment to provide alignment with device cover plate. When exit device end cap is installed, no raised edges will protrude.

F. Closers and Door Control Devices:

1. Acceptable manufacturers:

- a. LCN Closers 4040XP Series*
- b. Sargent 281
- c. Corbin Russwin DC8000

2. Characteristics:

- a. Door Closers shall be cast iron construction, minimum 1 ½" closer piston diameter, manufactured in USA, to be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory and shall have minimum ten year service record in K-12 school environments. Requests for approval for surface door closers shall be accompanied by project references. Approval shall be solely at the architect's discretion. All closers (overhead, surface and concealed) to be of one manufacturer and carry manufacturer's thirty year warranty
- b. Door closers to have fully hydraulic, full rack and pinion action.
- c. All closers to utilize a stable fluid withstanding temperature range of 120°F to -30°F without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors to be provided with temperature stabilizing fluid that complies with standards UBC 7-2 (1997) and UL 10C.
- d. Spring power to be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Spring power adjustment (LCN Fast™ Power Adjust) allows for quick and accurate power adjustment and visually shows closer power size settings by way of dial adjustment gauge located on closer spring tube. Hydraulic regulation to be by tamper-proof, non-critical valves. Closers to have separate adjustment for latch speed, general speed and back check.
- e. All closers to have solid forged steel main arms (and forearms for parallel arm closers) and where specified to have a cast-in solid stop on the closer shoe ("CUSH"). All parallel arm mounted closers to have "EDA" type arms or, where door travel on out-swing doors must be limited, use "CUSH" or "SCUSH" type closers. Auxiliary stops are not required when "CUSH" type closers are used. Provide drop plates where top rail of door is not sufficient for closer mounting. Provide "cush shoe supports" and "blade stop spacers" where dictated by frame details.
- f. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped provide adjustable units complying with ADA and ANSI A-117.1 provisions for door opening force.
- g. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors to provide for corridor clear width as required by code. Where possible, mount closers inside rooms.

- h. Powder coating finish to be certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
- F. Floor Stops and Wall Bumpers:
- 1. Acceptable manufacturers:
 - a. Ives*
 - b. Trimco
 - c. Rockwood Manufacturing
 - 2. Characteristics: Refer to Hardware Headings.
- G. Protective Plates:
- 1. Acceptable manufacturers:
 - a. Ives*
 - b. Trimco
 - c. Rockwood Manufacturing
 - 2. Characteristics:
 - a. Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
 - b. Materials:
 - 1) Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
 - c. Fabricate protection plates not more than 2 inches less than door width on push side and not more than 1 inch less than door width on pull side.
 - d. Heights:
 - 1) Kick plates to be 10 inches in height.
 - 2) Mop plates to be 8 inches in height.
 - 3) Kick plates and Mop plates to be 1" less than bottom rail height where applicable.
- H. Thresholds:
- 1. Acceptable manufacturers:
 - a. Zero Weatherstripping Co., Inc.*
 - b. National Guard Products, Inc.
 - c. Reese Industries
 - 2. Types: Indicated in Hardware Headings.
- I. Door Seals/Gasketing:
- 1. Acceptable manufacturers:
 - a. Zero Weatherstripping Co., Inc.*
 - b. National Guard Products, Inc.
 - c. Reese Industries
 - 2. Types: Indicated in Hardware Headings.

2.2 Materials and Fabrication

- A. **Manufacturer's Name Plate:** Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. **Base Metals:** Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and

hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

- C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 - 2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
 - 4. Do not use thru-bolts or sex bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of adequately fastening the hardware, or otherwise found in Headings. Coordinate with wood doors and metal doors and frames. Where thru-bolts are used, provide sleeves for each thru-bolt as a means of reinforcing the work, or use sex screw fasteners.

2.3 Hardware Finishes

- A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).
- B. Provide finishes that match those established by ANSI or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."
- E. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
 - 1. Hinges: 652 (US26D) Satin Chrome Plated Steel
 - 2. Continuous Hinges: 628 (US28) Clear Anodized Aluminum
 - 3. Flush Bolts: 626 (US26D) Satin Chrome Plated Brass/Bronze
 - 4. Mortise Locks: 626 (US26D) Satin Chrome Plated
 - 5. Exit Devices: 626 (US28D) Satin Chrome Plated Covers – 630 Satin Stainless Steel Touch pad – 628 Anodized Aluminum Mechanism Case
 - 6. Door Closers: 689 Powder Coat Aluminum
 - 7. Push Plates: 630 (US32D) Satin Stainless Steel
 - 8. Pull Plates: 630 (US32D) Satin Stainless Steel

9. Protective Plates: 630 (US32D) Satin Stainless Steel
10. Door Stops: 626 (US26D) Satin Chrome Plated Brass/Bronze
11. Overhead Holders: 630 Satin Stainless Steel and 689 Powder Coated Steel (as scheduled)

3.0 - EXECUTION

3.1 Installation

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
 1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
 2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
 3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
- B. Install each hardware item in compliance with the 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, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers".
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Door Hardware Supplier's Field Service:
 1. Inspect door hardware items for correct installation and adjustment after

- complete installation of door hardware.
2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
3. File written report of this inspection to Architect.

HARDWARE SCHEDULE

HARDWARE SET: A EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
1	REMOVABLE MULLION	KR4954 STAB	VON
1	PANIC HARDWARE	CD-98-DT-SNB	VON
1	PANIC HARDWARE	CD-98-NL-SNB	VON
4	CYL/CORE	AS REQUIRED	
2	SURFACE CLOSER	4040XP SCUSH MC TBWMS	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MULLION SEAL	139N PSA	ZER
2	MEETING STILE	328AA-S (PAIR)	ZER
1	GASKETING	8144SBK PSA	ZER
2	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: B EACH TO HAVE:

6	HINGE	5BB1HW 4.5 X 4.5 NRP	IVE
2	FIRE EXIT HARDWARE	9827-L-F-LBR-499F-SNB	VON
2	CYL/CORE	AS REQUIRED	
2	SURFACE CLOSER	4040XP SCUSH MC TBWMS	LCN
2	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
2	MAGNET	SEM7850	LCN
1	GASKETING	188SBK PSA	ZER
1	ASTRAGAL	55AA X 555AA	ZER

COORDINATE HARDWARE WITH FIRE AND ELECTRICAL SYSTEMS.

HARDWARE SET: C EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	CLASSROOM LOCK	L9070	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4040XP REG ARM MC TBWMS	LCN
1	KICK PLATE	8400 10" 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	188SBK PSA	ZER

HARDWARE SET: CC

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 5	IVE
1	CLASSROOM LOCK	L9070	SCH
1	CYL/CORE	AS REQUIRED	-
1	SURFACE CLOSER	4040XP EDA ARM MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKETING	188SBK PSA	ZER

TEMPLATE CLOSER FOR 180 DEGREE SWING.

HARDWARE SET: D

EACH TO HAVE:

3	HINGE	5BB1HW 4.5 X 4.5	IVE
1	CLASSROOM DEAD LOCK	L463	SCH
1	CYL/CORE	AS REQUIRED	-
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4040XP EDA MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	MOP PLATE	8400 6" X 1" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: E

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	OFFICE/ENTRY LOCK	L9050	SCH
1	CYL/CORE	AS REQUIRED	-
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: F

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080	SCH
1	CYL/CORE	AS REQUIRED	-
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE

HARDWARE SET: G

ALL HARDWARE BY OVERHEAD/COILING DOOR MANUFACTURER/SUPPLIER.

HARDWARE SET: H
EACH TO HAVE:

	HINGE	DOOR MFR STD	
1	FIRE EXIT HARDWARE	3547A-L-BE-F	VON
1	FIRE/LIFE CLOSER	4040SE TBWMS (PULL-SIDE)	LCN
1	MOUNTING PLATE	4040SE-18 (AS REQ'D)	LCN
1	OH STOP	90S	GLY

COORDINATE HARDWARE WITH SECTION 084123.

COORDINATE HARDWARE WITH FIRE AND ELECTRICAL SYSTEMS.

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

BALANCE OF HARDWARE BY FIRE RATED ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

END OF SECTION

1.0 - GENERAL

1.1 Scope

The work under this section consists of all glass and glazing.

1.2 Quality

- A. Glazing shall be provided to comply with Table 5.3.1 Building Envelope Requirements - Climate Zone 1 of the Alabama Building Energy Conservation Code, and the 2015 International Building Code.
- B. Glazing for Fire-Rated Door and Window Assemblies: Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.
- C. Safety Glazing Products: Comply with size, glazing type, location, and testing requirements of 16 CFR 1201 for Category I and II glazing products, and requirements of authorities having jurisdiction.
- D. Glazing Industry Publications: Comply with glass product manufacturers' recommendations and the following:
 - 1. GANA Publications: GANA Laminated Division's 'Laminated Glass Design Guide' and GANA's 'Glazing Manual.'
 - 2. IGMA Publication for Insulating Glass: IGMA TM-3000, 'Glazing Guidelines for Sealed Insulating Glass Units.'
- E. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

1.3 Samples

Submit for approval samples of each kind of glass required. Each sample shall bear a label indicating the kind and quality of the glass and the manufacturer.

1.4 Warranty

- A. Warranty for Coated-Glass Products: Manufacturer's standard form, signed by coated-glass product primary manufacturer or manufacturer/fabricator, as applicable, agreeing to replace coated-glass units that display peeling, cracking, and other deterioration in metallic coating under normal use, within 10 years of date of Substantial Completion.
- B. Warranty for Laminated Glass: Manufacturer's standard form, signed by laminated-glass product manufacturer/fabricator, agreeing to replace laminated-glass units that display edge separation, delamination, and blemishes exceeding those allowed by ASTM C 1172, within five years of date of Substantial Completion.
- C. Warranty for Insulating Glass: Manufacturer's standard form, signed by insulating-glass product manufacturer/fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by the obstruction of vision by dust, moisture, or film on interior surfaces of glass, within 10 years of date of Substantial Completion.
- D. Installer's Warranty: Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or

deterioration of glass or glazing products due to faulty installation, within 2 years of date of Substantial Completion.

2.0 - PRODUCTS

2.1 Manufacturer

Glass products shall be as manufactured by Vitro Architectural Glass., Guardian Industries, Inc., or Pre-approved equal. Laminated pattern glass shall be as manufactured by North American Glass Fabrication. Fire-rated, safety-rated wired glass shall be manufactured by Technical Glass Products.

2.2 Materials

Glass shall be as defined in, and in accordance with Code of Federal Regulations 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

- A. Compound for face glazing, or where shown or indicated as compound shall be an oleo-resinous knife grade elastic glazing compound such as Tremco's Trem-glaze, Pecora's M-242, or Dap-1012.
- B. Sealant where shown or indicated shall be Tremco "Mono," Dow Corning 780, or GE's construction sealant.
- C. Tape where shown or indicated shall be Tremco's 440 Tape, Curtis 606 Tape, or Warflex's "Sealing Tape."
- D. Neoprene setting blocks as approved by glass manufacturer Shore "A" Hardness approximately 70 to 90.
- E. Neoprene spacer shims as approved by glass manufacturer Shore "A" Hardness approximately 40 to 60.
- F. Neoprene glazing beads as approved for aluminum store front and doors.
- G. Color of compound, sealant, tape, etc. shall be as selected.
- H. Glare reducing glass shall be 1/4" thick Solargray, Solargreen, or Solarbronze as selected.
- I. Glare reducing Tempered Safety glass shall be 1/4" thick Solargray, Solargreen, or Solarbronze as selected. When multiple small glass panes are used in the same door or sidelight, provide one (1) only Decal and furnish certificate verifying the use of Safety Glass in other panels.
- J. Interior Tempered Safety Glass shall meet 16CFR1201 Test Requirements, Cat. 1 and/or Cat. 2 as applicable. Etch label and furnish certificate verifying the use of Tempered Safety Glass.
- K. Fire safety glass shall be 5/16" thick clear laminated fire rated and impact safety rated glass. Approved equal to Pilkington Fire-Lite Plus and shall meet impact safety rating 16CFR1201 (Cat.1) if less than 9 sq. ft. and (Cat. 2) if greater than 9 sq. ft. Provide with label at all rated doors and frames..
- L. 1" insulating Glass - Pre-assembly Low-E unit consisting of 1/4" float glass exterior lite, 1/2" dehydrated air space and clear 1/4" float glass with Low-E interior lite meeting performance requirement for Class A or Class B Accelerated Test as

specified in ASTM E744 with no visible fog. Match color on metal spacer to glazing frame. As selected by Architect. Provide minimum SHGC of .25.

1. Solarban60 Solar Gray + Clear

- M. Spandrel Glass - 1/4" thick, float glass with the opacifying coating on the number 2 (inboard) face. Temper or heat strengthen in accordance with the current Glass Tempering Association, Engineered Standard Manual. Opacifying coating shall be Opaci-Coat-300 Coating shall be Silicone water based glastomer with a min/max wet thickness of 8 mils. (0.008") and a protective coating of silicone rubber a minimum wet thickness of 13 mils (0.0013"). Color as selected by Architect. Provide minimum SHGC of .25.

1. Solarban60 Solar Gray + Clear

3.0 - EXECUTION

3.1 Preparation

- A. Immediately prior to glazing, all surfaces shall be wiped clean and free of protective coatings, moisture, and dust. All glazing shall be done when the temperature is 35° F or above.
- B. All sash shall be checked prior to glazing to make certain that the opening is square, plumb, and secured in order that uniform face and edge clearances are maintained. Inspect all butt and miter joints. If these joints are open, they shall be sealed with sealant prior to glazing. All ventilators shall be properly adjusted. Maintain 1/8" minimum bed clearance between glass and sash on both sides.
- C. All glass indicated in non-rated doors shall be tempered with etched label.
- D. All glass indicated in rated doors shall be fire safety glass with etched label.

3.2 Setting

- A. Glazing preparation and procedures shall be as outlined in the Glazing Manual of the Flat Glass Jobbers Association.
- B. Glass shall be set without springing, and with an equal bearing the entire width and length of each piece.
- C. The actual sizes required shall be determined by measuring the frames to receive the glass. All glass shall be factory labeled.
- D. Glass shall be properly cut and set in accordance with the best practice of the trade.
- E. Center glass in glazing rabbet to maintain recommended clearances at perimeter for expansion and contraction, each face of glass.

3.3 Protection

Immediately after installation, a marker letter shall be placed upon each pane of glass for protection against careless breakage. All broken, cracked, scratched, or otherwise damaged glass shall be replaced.

3.4 Cleaning

- A. Upon completion of the project, all glass shall have paint, dirt, and other stains removed; glass shall then be washed clean and polished.

- B. Labels on glass shall not be removed until final approval is obtained, and glass is ready for cleaning.

END OF SECTION

GYPSUM DRYWALL & LIGHT GAUGE METAL STUD SYSTEM - SECTION 09260

1.0 - GENERAL

- 1.1 Scope
The work of this section consists of the furnishing and erection of all metal studs and gypsum wall board, finished ready for field decoration.
- 1.2 Submittals
 - A. Submit manufacturer data, samples and shop drawings.
- 1.3 Applicable Standards
Current editions or revisions of Federal and ASTM standards shall apply unless specifically noted otherwise.
- 1.4 Delivery and Storage
All materials shall be delivered to the job in original unopened containers or bundles and stored in a place protected from the elements and damage.

2.0 - PRODUCTS

- 2.1 Materials
 - A. Interior wall metal studs shall be cold rolled "Cee" design 25-gauge steel, prepared to receive self-drill, self-tapping screw fasteners. Metal studs web shall be punched to facilitate work of other crafts. At interior wall with plumbing, provide metal stud framing wide enough to fully conceal plumbing work.
 - B. Exterior wall metal studs shall be 3-5/8" 20-gauge metal studs and runners, welded system, unless noted otherwise. At all areas to receive masonry veneer, use 18-gauge metal studs and runners.
 - C. Track shall be of proper dimension to receive metal studs and provide a close friction fit.
 - D. Metal studs and track shall be hot-dipped galvanized.
 - E. Wall board shall be a mill fabricated gypsum board consisting of a core of processed gypsum rock encased in a heavy mineral finished paper on the face side and a strong liner paper on the back side. The face paper shall be folded around the long edges to reinforce and protect the core and the ends shall be square cut and smooth finish. Thickness shall be as indicated on the Drawings but not less than 5/8".
 - F. Fire resistant wall board shall be a board having a specifically formulated core which shall meet Underwriter's Laboratory tests for a one-hour fire resistant rating. Material shall be equal to USG Sheetrock® Brand Ultralight Panels Fire code® X as manufactured by U.S. Gypsum, Fire-Shield® LITE® as manufactured by National Gypsum, Fireguard® by Georgia-Pacific.
 - G. Moisture- and Mold-resistant, Fire-resistant Gypsum Core shall be 5/8" thick Fire code equal to SHEETROCK® brand MOLD TOUGH™ FIRECODE® .

Provide at all walls subject to moisture and/or at walls behind drinking fountains, sinks, lavatories, urinals, water closets, and all other plumbing fixtures where drywall is indicated.

- H. For High Impact Areas as indicated provide USG Sheetrock® Brand Mold Tough® VHI Firecode® X Panels or pre-approved equal that meets testing requirements for High Impact. The main ASTM standard for abuse classification is **ASTM C1629** which specifies the levels of performance. Annex A1 describes test methods for testing products for Hard Body Impact Resistance.

ASTM C1629 makes reference to three other test methods for abuse resistance: **ASTM E695** for Soft Body Impact, **ASTM D4977** for Abrasion resistance, **ASTM D 5420** for Indentation Resistance.

- I. Runner channels shall be hot-rolled or cold-rolled steel and shall be galvanized or given a coat of rust-inhibitive paint. Runner channels shall be one and one-half inches (1-1/2") with flange approximately one-half inch (1/2") deep, spaced not over forty-eight inches (48") on centers. Hot Rolled Channel shall weigh not less than 850 pounds per 1,000 lineal feet; cold rolled channel shall weigh not less than 475 pounds per 1,000 feet.
- J. Fasteners shall be flat, countersunk head drywall screws, USG Type S or as approved, or annular nails for use with nailer bars or for wood.
- K. Trim shall be hot dip galvanized steel, corner bead, casing, and expansion strips.
- L. Joint tape shall be a heavy perforated cross fibered reinforced paper.
- M. Joint cement shall be a bedding and finishing cement especially prepared for use with reinforcing joint tape.
- N. Metal accessories shall be provided at all exterior corners, where a horizontal surface abuts a vertical surface or where an exposed edge of the wallboard abuts metal. Material shall be as manufactured by or as recommended by the manufacturer of the wall board used.
- O. Control joints shall be provided at all corners, intersections, ceilings, etc., subject to movement. Install control joints in areas as recommended by manufacturer and/or as indicated on drawings.

2.2 Auxiliary Materials

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

3.0 - EXECUTION

- 3.1 A. Floor and ceiling tracks aligned accurately according to partitions layout and anchored securely into structural floor and overhead structure at maximum of 16" o.c. All walls shall extend to underside of deck above.
- B. Studs spaced not greater than 16" o.c. for gypsum board, anchored securely to floor and ceiling tracks. Set studs approximately 2" from abutting partitions or walls at corners, openings and ends of partitions. Anchor door bucks to adjacent studs.
- C. Partitions shall be rigid, sound and plumb with all necessary metal trim, clips and accessories for a complete installation.

- D. Gypsum board shall be applied in single layer or multiple layers as indicated on the Drawings by screw application to metal studs with joints taped and filled with manufacturer's recommended joint compound.
- E. Application of gypsum board and joint finishing shall not begin under cold or damp conditions. The temperature shall be a minimum of 35° before work is begun and shall be maintained at this level or above until the joint cement is set dry and hard. Adequate ventilation shall be provided at all times.
- F. Installation shall be in full accord with the recommendations of the manufacturer. Workmanship shall be by competent workmen experienced in the installation of wall board and all work shall be done in accordance with the best practices of the trade to give a smooth, straight, aligned surface which is ready for the finish.
- G. Apply metal trim at exposed edges.
- H. Neatly cut all openings so that they may be covered by plates and escutcheons.
- I. Vertical Furring - All vertical furring in ceiling shall be of 5/8" fire rated gypsum board on metal framing. DO NOT furr with acoustical panels.

3.2 Drywall Finish

- A. Temperature and Humidity Conditions
Do not install joint treatment compounds unless installation areas comply with the minimum temperature and ventilation requirements recommended by the manufacturer and conditions are acceptable to the installer.
- B. Finish exposed drywall surfaces with joints, corners, and exposed edges reinforced or trimmed as specified, and with all joints, fastener heads, trim accessory flanges and surface defects filled with joint compound in accordance with manufacturer's recommendation for a smooth, flush surface. Drywall finishing work will not be considered acceptable if corners or edges do not form true, level or plumb lines, or if joints, fastener heads, flanges of trim accessories or defects are visible after application of field-applied decoration.
 - 1. Refer to ASTM 6840 for guidelines for acceptable levels of finish.
 - a. Finish Level shall be no less than Level 3 for all exposed Gypsum Board.
- C. Joint and Corner Reinforcing
 - 1. Use joint tape to reinforce joints formed by tapered edges or butt ends of drywall units and at interior corners and angles. Set tape in joint compound then apply skim coat over tape in one application.
 - 2. Where open spaces of more than 1/16" width occur between abutting drywall units (except at control joints), prefill joints with joint compound and allow prefill to dry before application of joint tape.
 - 3. Provide control joints as recommended by manufacturer.
- D. Reinforce external corners of drywall work with specified type of corner bead.

Securely fasten metal corner beads as recommended by the manufacturer. Do not use fasteners which cannot be fully concealed by joint compound fill applied over flanges.
- E. Edge Trimming
Provide specified type of metal casing bead trim. Install in single unjointed lengths

unless run exceeds longest available stock length. Miter corners of semi-finished type trim. Coordinate installation of trim continuously with drywall installation.

F. Application of Joint Compounds

Use only compatible compounds from one manufacturer. After mixing, do not use joint compounds if recommended pot-life time has expired. Allow drying time between applications of joint compound in accordance with manufacturer's recommendations for the relative humidity and temperature levels at the time of application. In no case, allow less than 24 hours drying time between application to joint compound. Apply not less than 3 separate coats of joint compound over joints, fastener heads, and metal flanges. Joint compound treatment is not required at non-fire rated walls above suspended ceiling where partitions/walls are shown or specified to extend to structural deck or ceiling above suspended ceiling.

G. LEVELS OF FINISH. The following levels of finish are established as a guide for specific final decoration. The minimum requirements for each level shall be as described herein

1. Level 4:

All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a drywall primer prior to the application of final finishes. See painting/wallcovering specification in this regard.

This level should be specified where flat paints, light textures, or wallcoverings are to be applied.

In critical lighting areas, flat paints applied over light textures tend to reduce joint photographing. Paints with sheen levels other than flat and enamel paints are not recommended over this level of finish.

The weight, texture, and sheen level of wallcoverings applied over this level of finish should be carefully evaluated. Joints and fasteners must be adequately concealed if the wallcovering material is lightweight, contains limited pattern, has a gloss finish, or any combination of these finishes is present. Unbacked vinyl wallcoverings are not recommended over this level of finish.

END OF SECTION

1.0 - GENERAL

1.1 Related Documents

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

1.2 Summary

A. Section Includes:

1. Acoustical ceiling panels.
2. Exposed grid suspension system.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:

1. Section 09260 - Gypsum Board
2. Section 09910 - Painting
3. Division 15 Sections - Mechanical Work
4. Division 16 Sections - Electrical Work

C. Substitutions:

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.
See Section 01360 – Product Substitution for submittal process information and Product Substitution Form.

1.3 References

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

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
 9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
 10. ASTM E 1264 Classification for Acoustical Ceiling Products.
 11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
- B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 Submittals

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.5 Quality Assurance

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less

2. Fire Resistance Ratings: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which acoustical ceilings function as a fire protective membrane and tested per ASTM E 119.
 - a. Protect lighting fixtures and air ducts to comply with requirements indicated for rated assembly.
 - C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.
- 1.6 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, and 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 damaged units in any way.
- 1.7 Project Conditions
 - A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to and after installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions within the space or with interfacing construction such as walls or soffits. Abnormal conditions include exposure to chemical fumes, vibrations, moisture, excessive humidity, or excessive dirt or dust buildup.

HumiGuard Plus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.
- 1.8 Warranty
 - A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
 1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 2. Grid System: Rusting and manufacturer's defects
 3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
 - B. Warranty Period Humiguard:

1. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 Maintenance

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

2.0 - PRODUCTS

2.1 Manufacturers

- A. Ceiling Panels:
Armstrong World Industries, Inc. USG or pre-approved equal.

2.2 Acoustical Ceiling Units

- A. Acoustical Panels Type L1 (without fire guard): Product:
Fine Fissured, 1728
1. Surface Texture: Medium
 2. Composition: Mineral Fiber
 3. Color: White
 4. Size: 24in X 24in X 5/8in
 5. Edge Profile: Square Lay-In for interface with Prelude XL 15/16" Exposed Tee.
 6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.55.
 7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
 8. Emissions Testing: < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1- 2007, "Ventilation for Acceptable Indoor Air Quality"
 9. Flame Spread: ASTM E 1264;
 10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.85.
 11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
 12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

B. Acoustical Panels Type ML: Product: Clean Room VL, 868

1. Surface Texture: Smooth
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 5/8in
5. Edge Profile: Square Lay-In for interface with Prelude Plus XL Fire Guard 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, N/A.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 40
8. Emissions Testing: < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1- 2007, "Ventilation for Acceptable Indoor Air Quality"
9. Flame Spread: ASTM E 1264; Fire Resistive
10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.80.
11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

2.3 Suspension Systems (WITHOUT FIRE GUARD CEILING TILES)

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized aluminum as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized aluminum in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
1. Structural Classification: ASTM C 635 HD.
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

2.4 Suspension System for Use with Clean Room VL. 868

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized aluminum as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized aluminum in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
 - 1. Structural Classification: ASTM C 635 HD.
 - 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 - 3. Acceptable Product: Prelude Plus XL Fire Guard 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

3.0 - EXECUTION

3.1 Examination of Adjoining Work

Do not proceed with installation until all wet work or work that has become wet such as concrete, CMU, terrazzo, plastering and painting has been completed and thoroughly dried out.

3.2 Preparation

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 Installation

- A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- B. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight. Main beams are to be supported with hanger wires within 8" of vertical surface terminations.
- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

- D. Vertical Wall or soffit surfaces intended to be paint finished shall receive the first coat of primer or block fill prior to installation of wall moulding.
- E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 Adjusting and Cleaning

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
- C. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field regularized edges that are exposed to view.
- D. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

1.0 - GENERAL

1.1 Section Includes

- A. Flooring and accessories as shown on the drawings and schedules as required for complete installation.

1.2 Submittals

- A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.
- B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.
- C. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
- D. See Section 01350 – Submittals.

1.3 Quality Assurance and Regulatory Requirements

- A. Installer Qualifications: Firm with minimum five years successful experience completing resilient tile installation similar to that required.
- B. Provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
- C. Materials within each area shall be from one production run as indicated by cartons bearing the same manufacturer's color code.
- D. Materials shall be uniform in thickness and size with accurately cut edges. No seconds, off-goods, or remnants will be allowed.
- E. Provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
 - 1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I.
 - 2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.
- F. Pre-Installation Conference: Conduct meeting at site prior to commencing work related to resilient tile installation.
 - 1. Require attendance of parties directly affecting resilient tile installation.
 - 2. Review site conditions, procedures, and coordination required with related work.

1.4 Environmental Conditions

- A. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- B. Store materials in a clean, dry, enclosed space off the ground, and protected from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.
- C. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F (18°C) and a maximum temperature of 100°F (38°C) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
- D. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently

dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

2.0 - PRODUCTS

2.1 Resilient Tile Flooring Materials

- A. Provide "Standard Excelon" Tile Flooring manufactured by Armstrong or pre-approved equal, having a nominal total thickness of 1/8", 12 in. x 12 in. Color and pattern as selected by architect from manufacturer's full range of colors. Vinyl composition tile shall conform to the requirements of ASTM F 1066, Class 2 – through pattern.
- B. Resilient tile patterns shall be indicated on architectural plans. Spacing and patterns shall be as indicated or directed.

2.2 Adhesives

- A. For Tile Installation System, Full Spread: Resilient Tile Adhesive under the tile and Wall Base Adhesive at the wall base shall be as manufactured or recommended by the manufacturer of the materials used. Provide epoxy adhesive at "wet" areas.

2.3 Accessories

- A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), shall be as manufactured or recommended by the manufacturer of the products used.
- B. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
- C. Provide transition/reducing strips tapered to meet abutting materials as shown on drawings.
- D. Provide threshold of thickness and width as shown on the drawings.
- E. Provide feature resilient edge strips, 1" wide x 24" length, of equal gauge to the flooring, homogeneous vinyl composition and color as selected by the Architect from standard colors available.
- F. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.
- G. Provide expansion joint cover equal to Construction Services GFST Series. Install per manufacturer's written instructions.

2.4 Warranty

- A. Flooring materials under this section shall be warranted against manufacturing defects for five years from date of substantial completion.
- B. Installation shall be warranted for two years from date of substantial completion. Installation warranty shall include guarantee that products have been installed according to manufacturer's installation instructions, edition which is current at the time of installation.
- C. Prorated Manufacturer's Warranty
 - 1. **Within One Year:** If a defect is reported in writing to the manufacturer within one year of final completion, manufacturer will supply new material of the same grade sufficient to repair or replace the defective material. Manufacturer will also pay for reasonable labor costs.

2. **Within Two Years:** If a defect is reported in writing to the manufacturer after one year, but within two years of substantial completion, manufacturer will supply new material of same grade sufficient to repair or replace defective material. Manufacturer will also pay fifty per cent of reasonable labor costs.
3. **After Two Years:** If a defect is reported in writing to the manufacturer after two years, but within five years of substantial completion, manufacturer will supply new material of same grade sufficient to repair or replace defective material.

3.0 - EXECUTION

3.1 Inspection

- A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- C. Report conditions contrary to contract requirements that would prevent a proper installation. **DO NOT** proceed with the installation until unsatisfactory conditions have been corrected.

3.2 Preparation

- A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects as recommended by the flooring manufacturer.
- B. Remove paint, varnish, oils, release agents, sealers, and waxes. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents.
- C. For Tile Installation System, Full Spread perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes", ASTM F 1869, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" or as required by manufacturer to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 80% and MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.
- D. For Tile High-Moisture Installation Warranty, perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes", ASTM F 1869, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride", or required by manufacturer to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 90% and MVER shall not exceed 7 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed

above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained.

- E. Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained
- F. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.3 Installation of Tile Flooring

- A. Install flooring in strict accordance with the latest edition of Manufacturer's Guaranteed Installation System and recommended work practices from the Resilient Floor Covering Institute.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
- F. Border pieces less than 6" wide are NOT acceptable.
- G. Installation Direction: Quarter-turned unless otherwise indicated by Architect.

3.4 Installation of Accessories

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
- C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
- D. Apply butt-type and/or overlap metal edge strips where shown on the drawings, before and/or after flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.5 Cleaning and Protection

- A. Immediately After Installation
 - 1. Sweep, Dust mop or vacuum the floor thoroughly to remove all loose dust and dirt.
 - 2. Remove any dried adhesive residue with a clean white cloth dampened with mineral spirits, carefully follow warnings on container.
 - 3. Damp mop the floor with a properly diluted neutral detergent solution as recommended by manufacturer.
 - 4. Apply high quality commercial floor sealer and Two (2) coats of high quality commercial floor polish as recommended by manufacturer.
DO NOT wet wash, machine scrub or strip the floor for at least 4 to 5 days after installation. This is to prevent excess moisture from interfering with the adhesive bond and/ or seam treatments.

- B. Preparation for Use
 - 1. Scrub the floor with a neutral detergent and scrubbing pad as recommended by manufacturer.
 - 2. Thoroughly rinse floor and allow to dry.
 - 3. Apply Three (3) additional coats of high-quality commercial floor polish as recommended by Manufacturer for a total of Five (5) coats for final acceptance.
- C. Perform maintenance according to the latest edition of manufacturer's Guaranteed Installation System.
- D. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

RESILIENT RUBBER BASE AND ACCESSORIES- SECTION 09653

1.0 - GENERAL

1.1 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The Construction Waste Management plan prepared by the Construction Manager for coordination of waste material recycling is hereby incorporated by the reference as requirement of this section. Work under this section shall conform to the provisions outlined in the Plan and shall conform with the local recycling Standards to provide a coordinated effort to maximize reuse of waste materials.

1.2 Submittals

- A. Submit for the approval of the Architect samples of each color and type of material. Mark each sample with the manufacturer's name, type material, pattern, color, catalog number, thickness, name of contractor, and name of project.

1.3 Delivery and Storage

- A. Deliver materials to site in manufacturer's original, unopened containers clearly marked with manufacturer's brand name, color, and pattern numbers, and production run color code. Care shall be taken to prevent damage and freezing during delivery, handling, and storage.
- B. Store materials at site for at least 24 hours before installation.
- C. Maintain temperature of spaces where materials are stored and are to be installed at not less than 60° for at least 24 hours before installation. Thereafter, maintain a minimum temperature of 60°F.

2.0 - PRODUCTS

2.1 General

- A. Materials shall be uniform in thickness and size with accurately cut edges. No seconds, off-goods, or remnants will be allowed.
- B. Colors shall be uniform throughout.
- C. Materials within each area shall be from one production run as indicated by cartons bearing the same manufacturer's color code.
- D. Interior finish materials shall comply with flame spread limitations and smoke production limitations as follows. Tests shall be performed by an independent testing laboratory.

Walls and Ceilings	Flame Spread	25 or less ASTM E-84.
	Smoke Production	350 or less ASTM E-84.
Floors	Flame Spread	75 or less ASTM E-84.
	Smoke Production	350 or less ASTM E-84.

2.2 Manufacturers

- A. Rubber Base Manufacturers
 - 1. Tarkett (Basis of Design)
 - 2. Roppe

3. Flexco
 4. Mannington
- B. Transition Material Manufacturers:
1. Tarkett
 2. Roppe
 3. Flexco
 4. Mannington
- C. Requests for substitution shall be considered in accordance with provision of Section 01360 and received by Architect at least 10 days prior to bid.
- 2.3 Wall Base Materials
- A. Rubber Base shall be 4" high x running length. Rubber base shall be Johnsonite, Roppe or approved equal. Base type and color as specified on Finish Legend.
- B. Provide 1/8" ga., 4 " high Tarkett/Johnsonite Baseworks Thermoset Rubber wall base standard profile conforming to ASTM F1861.
1. Color to be selected by Architect from manufacturer's full range of colors.
 2. Refer to manufacturer's written installation instructions for complete installation details.
- C. Refer to Section 09560 for Flexco Base Specialty.
- D. Adhesives, including primer, shall be as manufactured or recommended by the manufacturer of the materials used.
- E. Outside corners are to be mitered. V-cut back of base strip to two thirds of its thickness and fold. Use Tool # 532 cove base groover gunlach or equal. Inside corners are to be mitered.
- 4' lengths or less and pre-mitered corners are not acceptable**
- F. Provide caulk to fill in at bullnose corners.
- 2.4 Floor Transition Materials
- A. Provide transition strips tapered to meet abutting materials on drawings.
- 2.5 Adhesives:
- A. Wall Base Adhesives shall be as manufactured or recommended by the manufacturer of the materials used. Provide epoxy at "wet areas".
1. Wall Base Adhesives
 - a. Tarkett/Johnsonite 960 Wall Base Adhesive for porous surfaces
 - b. Tarkett/Johnsonite 946 Premium Contact Adhesive for non-porous surfaces
 - c. Tarkett/Johnsonite 965 Flooring and Tread Adhesive
 - d. Tarkett/Johnsonite 996 Two-Part Epoxy Adhesive
 - e. Tarkett/Johnsonite 975 Two-Part Urethane Adhesive
 2. Caulk: Color Rite Inc.
- B. Floor Transitions: Adhesives shall be as manufactured or recommended by the manufacturer of the materials used.

3.0 - EXECUTION

3.1 Inspection

Surfaces to receive rubber base shall meet the minimum requirements established by the rubber base manufacturer. Examine surfaces and correct defects before starting applications.

3.2 Precautions During Installations

- A. Spaces in which rubber base material is being set shall be closed to traffic and to other work until the base is firmly set.
- B. Where solvent-based adhesive is used, safety sparkproof fans shall be provided and operated when natural ventilation is inadequate. Smoking shall be prohibited.

3.3 Installation

- A. Install rubber base materials only after all finishing operations have been completed. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by rubber base manufacturer.
- B. Mix and apply adhesive in accordance with the manufacturer's instructions. Cover the area evenly and only to the extent which can be covered with rubber base material in the recommended working time of the adhesive.
- C. Base shall be applied in such a manner that the entire under- surface shall be securely bonded in place. Base shall be laid tightly so that each piece is in contact with the adjoining pieces and all joints are in true alignment.
- D. Apply resilient base to permanent walls, cabinets, and fixtures in rooms or areas as specified. Install base in as long lengths as practicable. Press down so that bottom cove edge follows floor. Scribe accurately to abutting materials.

3.4 Adjustments

Inspect and make necessary adjustments after heat is applied continuously in finished areas. Any portion of the rubber base which has not seated in a level plane with surrounding base and all damaged, imperfect, or improperly installed base shall be warmed, carefully removed, and new base of the same color and thickness substituted.

3.5 Cleaning and Waxing

Remove stains from base and clean as required and recommended by manufacturer.

3.6 Surplus Materials

Unused runs and one full carton of materials shall be left at the job and turned over to the Owners.

END OF SECTION

1.0 – GENERAL

1.1 Related Documents

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

1.2 Summary

- A. This section includes the following:
 - 1. Resinous flooring system as shown on the drawings and in schedules.
- B. Related sections include the following:
 - 1. Cast-in-Place Concrete, Section 03300

1.3 System Description

- A. The work shall consist of preparation of the substrate, the furnishing and application of a seamless flooring system with decorative flake broadcast and chemical resistant topcoat.
- B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 60 Mils. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- C. 4 inch Cove base to be applied where noted on plans and per manufacturers standard details unless otherwise noted

1.4 Submittals

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Samples: A 6 x 6 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 Quality Assurance

- A. The Manufacturer shall have a minimum of 10 years' experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
- B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in writing in all phases of surface preparation and application of the product specified. Qualifications of applicator must be submitted to Architect by the General Contractor for approval within 24 hours after acceptance of bid. Architect reserves the right to reject applicator if they do not meet the specified qualifications and/or cannot provide documentation from manufacturer.

- C. No requests for substitutions shall be considered that would change the generic type of the specified System.
- D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
- E. A pre-installation conference shall be held between Applicator, General Contractor, manufacturer and the Owner for review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

1.6 Product Delivery, Storage, And Handling

- A. Packing and Shipping
All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
- B. Storage and Protection
 - 1. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
 - 2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Architect or other personnel.
- C. Waste Disposal
 - 1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 Project Conditions

- A. Site Requirements
 - 1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
 - 2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
 - 3. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- B. Conditions of new concrete to be coated with specified flooring material.
 - 1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured for 28 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests. Outside of these parameters manufacturer shall be consulted.
 - 2. Concrete shall have a light steel trowel finish (a hard steel trowel finish is neither necessary or desirable).
 - 3. Sealers and curing agents should not to be used.

4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements

1. Other trades shall be removed during the application of the product and 72 hours after completion

2.0 – PRODUCTS

2.1 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Spartacote Chip Pure Seamless Floor System. Not all manufacturers produce all categories and types of resinous flooring systems.
 - a. Also pre-approved are:
Sherwin Williams – Aqua Armor Decorative Mosaic Flooring
Stonhard – Stontec ERF
 2. Other Products must be approved prior to Bid and must be submitted in compliance with Section 01360 - Product Substitution.

2.2 Flooring

- A. Spartacote Chip Pure Seamless Floor System (60 mil floor system).
1. System Materials:
 - a. Primer: Primer/Scratch Coat 160 sq. ft/gal
 - b. Base resin: Pigmented Body Coat 65 sq. ft/gal
 - c. Broadcast Aggregate: Broadcast Chips
(size and quantity determined by selection of architect)
 - d. Grout Coat: MVT Tolerant UV Stable Glaze 160 sq. ft/gal
 - e. Top Coat: Surface Build Top Coat UV- Finish to be selected by Architect
 - f. Color: See Finish Legend
 2. Cove base (4 inch high with 2 inch diameter radius, smooth texture)
 - a. Cove resin; Cove Gel, Spartacote Broadcast quartz mixed with resin and troweled in place
 - b. Overlay Spartacote Chip Pure Floor System to match floor
 - c. Cove termination strip: clear plastic with 1/8" lip

2.3 Product Requirements

Material: Spartacote Resin	2-component epoxy
Density	12.70 lbs./gallon
VOC Content, Mixed	
Volume Solids	59%
Flash Point: Part A	>212°F
Part B	170 °F

Mixing Ratio	1:4 by Vol.
Pot Life, Approximate	60 minutes @ 75°F
Open to Foot Traffic	After 16 hrs. at 73°F
Curing Temperature	Minimum 50°F
Full Cure & Max. Resistance	7 days
Hardness, Shore D ASTM-D-2240	70-75
Compressive Strength ASTM-C- 579	6500 psi
Flexural Strength ASTM-C-580	2100 psi
Adhesion To:	110 psi
-New concrete (5 days)	550 psi
-Moist concrete (28 days)	580 psi
-Dry concrete (28 days)	

3.0 – EXECUTION

3.1 Examination

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
- B. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 Preparation

A. General

1. Existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products
2. Mechanical surface preparation
 - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 3-5 as described by the International Concrete Repair Institute.
 - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 - c. Wherever a free edge will occur, including doorways, wall perimeters, expansion joints, columns, doorways, drains and equipment pads, a ¼ inch deep by 3/16-inch-wide keyways shall be cut in.
 - d. Cracks and joints (non-moving) greater than 1/4-inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.

3. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 Application

A. General

1. The system shall be applied in six distinct steps as listed below:
 - a. Substrate preparation
 - b. Cove application
 - c. Primer Application
 - d. Topping/overlay application with flake aggregate broadcast.
 - e. Grout coat application
 - f. Topcoat application to thickness to reach even texture matching accepted sample
2. Immediately prior to the application of any component of the system, the surface shall be dry, and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Cove

1. Cove will be placed with the broadcast flake to match selected color and size at 4 inches in height unless otherwise noted on drawing with a 1-inch radius
2. The cove will be smooth with no texture above mid-radius

C. Topping

1. The topping shall be applied as a self-leveling system as specified. The primer must be applied and will not be a lift coat. The topping shall be applied in one to two lifts with a minimum thickness of 60 mils.
2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means.
4. The topping shall be applied over horizontal surfaces using a pin rake, trowels or other systems approved by the Manufacturer.
5. Flake shall be broadcast into the wet material to excess.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Grout coat and Topcoat

1. The grout coat shall be mixed and applied per manufacturer recommended procedure.
2. The grout coat shall be comprised of two components, a resin, hardener.
3. The grout coat will be applied at the rate of 160 sf per gallon.
4. The topcoat shall be mixed and applied per manufacturer recommended procedure.
5. The topcoat shall be comprised of two components, a resin, hardener.
6. The topcoat will be applied at a rate to achieve selected texture.
7. The finish floor will have a uniform texture free of dry or smooth areas that do not match the selected texture. The finished thickness shall be 60 mils.

3.4 Field Quality Control

A. Tests, Inspection

The following tests shall be conducted by the Applicator:

1. Temperature
Air, substrate temperatures, relative humidity, and, if applicable, dew point.
2. Perform moisture tests on concrete as follows:
 - a. Perform calcium chloride moisture tests in accordance with ASTM D1869 a minimum of twice for the first 1000 sq. ft and once for each additional 1000 sq. ft of area to be coated. Provide a written report of these test results including a letter of acceptance from the manufacturer.
 - b. Perform PH tests alongside each calcium chloride moisture tests. Provide a written report of these test results including a letter of acceptance from the manufacturer.

B. Coverage Rates

Rates for all layers shall be monitored by checking quantity of material used against the area covered.

C. Provide daily reports including detailed days activities, materials used with batch numbers and environmental conditions

3.5 Cleaning And Protection

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION

1.0 – GENERAL

1.1 Scope

- A. The work under this section consists of all painting, finishing work and related items.
- B. Paint or Painting shall include sealers, primers, stains, and oil, alkyd, latex and enamel paints and the application of these materials on surfaces prepared to produce a complete job whether or not every item is specifically mentioned. Where items are not mentioned they shall be furnished as specified for similar work. **Only work specifically noted as being excluded shall be left unfinished.**
- C. This specification includes field painting of all exposed piping, metal, ductwork, conduit, hangers, mechanical and electrical equipment in finished spaces. A finished space is one listed in the Finish Schedule as having finish materials on walls and/or ceiling.

1.2 List of Proposed Materials

The contractor shall either verify in writing that he intends to apply the products listed in the Paint Schedule, or shall submit for approval a list of comparable materials of another listed approved manufacturer. This submittal shall include full identifying product names and catalog numbers.

1.3 Submittals

- A. As soon as practicable after contract is let, submit for approval a detailed schedule of the paint proposed, listing the name of each product, and the surface to which it will be applied. Omission of any item from the approved schedule shall not relieve Contractor of his obligation.
- B. Product Data: For each paint system indicated. Include block fillers and primers.
 - 1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - 3. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer / supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product / color / finish was used, product data pages, Material Safety Data Sheet (MSDS), care and cleaning instructions, Touch-up procedures.

1.4 Storage of Materials

- A. Deliver all painting materials to job site at least three (3) days before beginning painting in original unbroken containers showing manufacturers name and type of paint, subject to Architect's inspection and approval.

- B. All materials used on the job shall be stored in a single place. Such storage place shall be kept neat and clean, and all damage thereto or its surroundings shall be made good. Any soiled or used rags, waste, and trash must be removed from the building every night, and every precaution taken to avoid the danger of fire.

1.5 Protection of Other Work

The painting contractor shall furnish and lay drop cloths in all areas where painting is being done to protect floors and other work from damage. He shall be responsible for any damage to other work and shall replace any materials which have been damaged to such an extent that they cannot be restored to their original condition. All damage must be repaired to the satisfaction of the Architect.

1.6 Job, Weather, and Temperature Conditions

- A. Maintain temperature in building at constant 65° F. or above and provide adequate ventilation for escape of moisture from the building in order to prevent condensation mildew, damage to other work, and improper drying.
- B. Exterior painting shall not be done when the temperature is below 50° F., while the surface is damp, or during cold, rainy, or frosty weather, or when the temperature is likely to drop to freezing within 24 hours. Avoid painting surfaces while they are exposed to hot sun.
- C. Before painting is started in any area, the area shall be broom cleaned and excessive dust shall be removed from all areas to be painted. After painting operations begin in a given area, clean only with commercial vacuum cleaning equipment.
- D. Adequate illumination shall be provided in all areas where painting operations are in progress.

1.7 Inspection of Surfaces

- A. Before starting any work, surfaces to receive paint finishes shall be examined carefully for defects which cannot be corrected by the procedures specified under paint manufacturers recommended "Preparation of Surfaces" and which might prevent satisfactory painting results. Work shall not proceed until such damages are correct.
- B. At areas of existing previously painted surface, the painting contractor shall field verify to assure compatibility between existing paint / coating material and the proposed new paint / coating material prior to procuring such new materials or products. Should a material or product compatibility conflict be discovered, the Contractor shall immediately notify the Architect for direction prior to proceeding with procuring such materials or products.
- C. The beginning of work in a specific area shall be construed as acceptance of the surfaces and the Contractor shall be fully responsible for satisfactory work.

1.8 Quality Assurance

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats. An inspection is required by manufacture in between prime coat and finish. Per the request of the Architect.
- C. Coordination of Work: Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings systems 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.
- D. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1.9 Cooperation With Other Trades

- A. This work shall be scheduled and coordinated with other trades and shall not proceed until other work and/or job conditions are as required to produce satisfactory results.
- B. The contractor shall examine the specifications for the various trades and shall thoroughly familiarize himself with all provisions regarding painting. **All surfaces that are left unfinished by the requirements of other sections shall be painted or finished as part of the work covered by this section.**

1.10 Maintenance Material

The contractor shall turn over to the Owner at the final inspection one gallon of each type and final color of the paint used on the project.

2.0 – PRODUCTS

2.1 Materials

- A. Except where otherwise specifically stated hereinafter, painting materials shall be products of one of the following manufacturers without substitution of "Equal", and shall be in that manufacturer's top grade of the respective type: Benjamin Moore, PPG, or Sherwin-Williams (Basis of Design). The term "top grade" refers to the manufacturers advertised line of best quality and not to "Professional" or "maintenance" lines. Any deviations from the requirements of this article shall only be by written change order with contract price adjusted accordingly.
- B. If job-mixed paints are used, submit proposed formulas for approval before proceeding with work. Thinning and tinting materials shall be as recommended by the manufacturer of the material used.
- C. Paints and finishing materials shall be free from skins, lumps, or any foreign matter when used, and pigments, fillers, etc., shall be kept well stirred while being applied.
- D. Interior finish materials shall comply with flame spread limitations and smoke production limitations as follows:

Walls and Ceilings - Flame Spread - 25 or less ASTM E-84.
Smoke Production - 350 or less ASTM E-84.

2.2 Colors

- A. Not limited to "stock" ready-mixed colors. Bring to directed shades or tones by mixing.
- B. In two-coat or three-coat work use slightly different colors for different coats to avoid skipping.
- C. Accent or feature areas when indicated shall be colors as selected. Color spacing and pattern shall be as indicated and/or directed. Maximum three (3) colors per area.
- D. Complete color scheme shall be as indicated on Finish Legend and Schedule.

2.3 Accessory Materials

Provide all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, sandpaper, dusters, cleaning solvents, and waste as required to perform the work and achieve the results specified herein.

3.0 – EXECUTION

3.1 Workmanship

- A. Surfaces shall be clean, dry, and free of oil, grease, dirt, mildew, loose or peeling paint, loose wood particles, and in proper condition for painting. All work shall be carefully done by skilled mechanics. Finished surfaces shall be uniform in coverage, gloss, finish and color, and free from brush marks. All coats shall be thoroughly dry before applying succeeding coats.
- B. Do all work in strict accordance with manufacturer's label directions.
- C. Hand sand woodwork until smooth and free from raised grain and other surface imperfections. First coat shall be applied before erection, to all surfaces, front and back. After woodwork is primed, fill nail holes, cracks, etc., full and smooth with putty. Lightly sand between coats where necessary in accord with good practice. Fully finish the top and bottom edges of doors and other woodwork edges not normally visible. Shellac knots and pitch streaks before painting.
- D. On concrete or masonry, do no painting until the surface has dried to the equivalent of eight days drying time under well ventilated conditions in good drying weather.
- E. Vertical surfaces to interface with suspended acoustical panel ceiling shall be primed/filled to a minimum of 8" about finish ceiling elevation prior to the installation of the acoustical panel ceiling perimeter wall edge molding/trim.
- F. Wash metal surfaces with mineral spirits to remove any dirt, grease, before applying materials. Where rust or scale is present, use wire brush, or sandpaper clean before painting. Clean shop coats of paint that become marred and touch up with specified primer.
- G. Treat galvanized metal surfaces chemically with compound designed for this purpose, apply as per manufacturer's directions before applying first paint coat.
- H. Remove and protect hardware panels, accessories, device plates, lighting fixtures, factory finished work, and similar items; or provide ample in-place protection. Upon completion of each space, carefully replace all removed items.

- I. Exterior doors shall have tops, bottoms, and side edges finished the same as the exterior faces of these doors. Interior door shall have vision windows, louvers, grilles, etc. Finished to match door frame.
- J. All closets and the interior of all cabinets shall be finished the same as adjoining room paint or stain unless otherwise scheduled. All other surfaces shall be finished the same as nearest or adjoining surfaces unless otherwise scheduled or directed.

3.2 Schedule

A. Exterior Metals

- 1. Galvanized metal shall be solvent clean with VM&P Naphtha.
Primer: S-W: Procryl B66 - 1310
Finish: Apply two coats
B66-600 Series
- 2. Non-primed metal shall be cleaned and etched with approved acid and washed with water.
Primer: S-W: Procryl B66 - 1310
Finish: Apply two coats
S-W: Pro Industrial DTM Acrylic Coating
- 3. Primed metals shall be inspected, scuffs, and abrasions sanded free of rust and receive full coat of primer. Concealed metal surfaces shall be spot primed.

Primer: S-W: Procryl B66 - 1310
Finish: Apply two coats
S-W: Pro Industrial DTM Acrylic Coating

B. Interior Metals

- 1. Non-primed metal shall be primed under this section.
Primer: S-W: Procryl B66 - 1310

Finish: Apply two coats
S-W: Pro Industrial DTM Acrylic Coating, Gloss
- 2. Primed metal shall have scratches and abrasions sanded free of rust and receive one full coat of primer.
Primer: S-W: Procryl B66 - 1310

Finish: Apply two coats
S-W: Pro Industrial DTM Acrylic Coating

C. Exterior Wood

Exposed wood of every description.

Primer: S-W: Exterior Latex Wood Primer, B42W8041
Finish: Apply Two Coats:
S-W: A-100 Exterior Latex Satin, A82 Series

D. Interior Woodwork and Trim

Apply two finish coats

Primer: S-W: Prep-rite Problock B51-620

Finish: Apply Two Coats:

S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600

E. Interior Gypsum Board and Plaster

1. Latex Finish system:

Primer: S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600

Finish Apply Two Coats:

S-W: ProMar 200 Zero VOC Interior Latex

2. High Touch areas - Microbicidal Latex Finish System – passive system for controlling / killing E-COLI, STAPH and MRSA Infections. With topcoat EPA registered No. 64695-1.

Prime Coat: Primer, latex, interior: S-W ProMar 200 Zero VOC Latex

Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.

a. First Coat: Microbicidal Latex, interior, matching topcoat.

b. Topcoat: Microbicidal Latex, interior, eggshell:

S-W Paint Shield Interior Latex Eg-Shel Microbicidal Paint, D12W51, at 4.0 mils (0.102 mm) wet, 1.8 mils (0.046 mm) dry, per coat. Brush and roll application only.

3. Ceiling Application:

****Note:** Provide flat finish for gypsum board in ceiling applications.

S-W: Pro-Mar Ceiling Paint, P200 Flat - B30W2651

4. High Performance System: (All areas not ceiling) ***

Primer: S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600

Finish Apply Two Coats:

S-W: Pro Industrial Pre-Catalyzed Waterbased Epoxy

Provide at all wet areas

S-W: Pro Industrial Waterbased Catalyzed Epoxy

F. Exterior Exposed Concrete and/or Clay Brick Masonry

Primer: Loxon Exterior / Interior Concrete & Masonry Primer / Sealer, A24W8300

Block Filler:S-W: Pro Industrial Heavy Duty Acrylic Block filler, B42-151

Finish:

S-W: A-100 Exterior Latex

Sheen indicated on Finish Schedule

G. Interior Concrete and Concrete Masonry

1. Concrete Masonry Surfaces shall be filled unless noted otherwise.

Prime: Pro Industrial Heavy Duty Acrylic Block Filler, B42W151

Finish Apply Two Coats:

S-W: Pro Industrial Pre-Catalyzed Waterbased Epoxy

Provide at all wet areas

S-W: Pro Industrial Waterbased Catalyzed Epoxy

a. Note: Block Filler should achieve a smooth pinhole free appearance.

b. This is necessary for proper protection before top coat is applied.

- c. Apply at recommended film thickness and spread rate as indicated by manufacturer.
 - d. Architect requires manufacturer' inspection between block filler and top coat.
 - 2. Concrete (Cast in Place or Precast)
 - Primer: Loxon Exterior / Interior Concrete & Masonry Primer / Sealer A24W8300
 - Finish Apply Two Coats:
 - S-W: Pro Industrial Pre-Catalyzed Waterbased Epoxy
 - H. Interior Wood Doors and Natural Finish Wood
 - One (1) coat - Stain, of selected color, S-W: Wood Classics "250" Interior Wood Stain, A49-800
 - Or One (1) coat – S-W: Wood Classics Waterborne Polyurethane
 - I. Stenciled Wall Identification
 - Provide one coat red color stencil identification on walls above ceilings of corridor, Smokestop, Horizontal Exit, enclosures and Firewalls. Wording shall be:
 - 1. Wording for fire walls shall indicate the rating and:
 - Fire Barrier - Protect All Openings
 - Both sides of wall are to be stenciled above the ceiling with one stencil sign to be placed above ceilings on all separate areas and maximum of 20'-0 o.c.
 - 2. Wording for smoke barriers:
 - Smoke Barrier - Protect All Openings
 - Both sides of wall are to be stenciled above the ceiling with one stencil sign to be placed above ceilings on all separate areas and maximum of 20'-0 o.c.
 - J. Exterior Ground Mount and Roof Top Mechanical Units, Equipment and Accessories. Painting contractor shall examine the site and all drawings and provide one (1) heavy coat of paint for each unit. Provide also one (1) coat primer for galvanized and/or rust areas.
- 3.3 Material Application
- A. All materials shall be applied in complete accordance with manufacturer's printed instructions.
 - B. All coats shall be thoroughly dry before the succeeding coat is applied.

END OF SECTION

1.0 - GENERAL

1.1 Scope

The work required under this section consists of room/wall/ signs and building plaque(s).

1.2 Submittals

- A. Submit a sample of signs including size, style of lettering, materials, and finish.
- B. Provide mounting templates.
- C. Signs shall conform to requirements as set forth by the AMERICANS WITH DISABILITIES ACT Accessibility Guidelines.
- D. Submit schedule indicating each room name and number indicated on Architectural Drawings with a corresponding space for Owner's mark-up for actual room name and number per school system of each room name and number along with sign type to the Architect for review.

2.0 - PRODUCTS

2.1 Manufacturers

Subject to compliance requirements. Provide products by the following

- 1. Amerson Engraving and Signage (Basis Of Design)
- 2. Devaney Sign Service, LLC
- 3. Leeds Architectural Letters, Inc.

2.2 Room and Wall Signs

- A. Provide photopolymer signs with Grade II Braille 3/4" numerals and 5/8" Letters to comply with ADA (American Disability Act). Signs shall be color selected from manufacturer's full line of colors.
- B. Room signs with message insert to have 1/16" front plate, minimum 1/32" solid spacer (no tape spacer) and 1/8" back plate.
- C. Room Signs (no message slot)- minimum 1/8" thick with 1/32" raised letters.
- D. Elevator and Stair Signs to be 6 x 6 and 1/8" thick with 1/32" raised letters.
- E. Exterior Signs - Exterior Aluminum .040 thick, factory painted and text to be silkscreened or inkjet print.
- F. Edge Condition - Square Cut.
- G. Corners - Round.
- H. Mounting:
 - 1. Sheet Rock - double sided tape
 - 2. Block or Brick - double sided tape and silicone
 - 3. Signs to be mounted with screws and anchors if specified.
 - 4. Signs mounted on wall adjacent to latch side of door 60" from floor to centerline of signs and 2" from edge of door frame to edge of sign.
- I. Provide signs as follows:
 - 1. All Offices, Classrooms, and Instructional Areas shall be 6" x 8" with 2-1/2" x 8" changeable clear message insert.

2. All other interior door signs except corridor and vestibule doors shall be 6" x 6" with no message strip.
 3. 6" x 6" Stair Sign at every stair on all floors with pictogram
 4. 6" x 6" tactile exit sign at all interior exit doors leading directly to the exterior with raised copy and Braille.
 5. Provide Exterior Signs (nominal 12" x 12") at all exterior entrances. Provide mounting as recommended by manufacturer. Exterior sign graphics to be provided by Architect.
 6. Provide Framed Signage with Clear View Window. Frame to Match Interior Signage cover) to accommodate 8.5 x 11 Landscape Floor Plan. Provide two (2) per Classroom and Assembly Area.
 7. Provide 8"x 8" sign adjacent to all doors leading to electrical equipment rooms containing stationary battery systems indicating "APPLY NO WATER" along with the type of battery system and current maintenance contact information.
 - J. Occupant Load Sign to be provided at every Auditorium, Gymnasium, Cafeteria (Assembly Areas) as required by IBC Section 1004.3
- 2.3 Pictorial Signs
- A. Provide 12" x 18" baked enamel on metal sign with International Symbol for Accessibility Wheelchair and lettering "Physically Handicapped Parking Only." Each sign shall have a "Van Accessible" sign mounted to post.
 - B. Provide Traffic Control signs as indicated on drawings and in accordance with the State of Alabama Highway Department Manual on Uniform Traffic Control Devices.
- 2.4 Project Sign - Specification requirements are listed in Section 01030.

3.0 - EXECUTION

- 3.1 Installation of Signs
Install signs on surfaces and at heights as directed.
- 3.2 Install "Physically Handicapped Parking Only" sign at Handicapped Parking Spaces as indicated.
- 3.3 Install Traffic Control Signs in accordance with State of Alabama Highway Department Manual on Uniform Traffic Control Devices.

END OF SECTION

1.0 -GENERAL

1.1 Scope

The work required under this section consists of custom engraved Information Plaque(s) to indicate pertinent roofing or re-roofing information on the actual roof site for the Owner's future use.

1.2 Submittals

Submit a full scale graphic representation of the proposed Information Plaque(s) for the Architect's approval.

1.3 Related Sections

- A. Division One
- B. TPO Roofing System, Section 07420

2.0 - PRODUCTS

2.1 Information Plaque

- A. Provide one Information Plaque at each distinguishable area of new roofing being provided under this contract as follows:
 - 1. Size: 3 ½" x 7" (min.)
 - 2. Material: 1/8" thick aluminum
 - 3. Finish: Match roof edge metal
 - 4. Text: Deep Engraved and painted to contrast
 - 5. Font: ¼" (min.) Romans
 - 6. Minimum Information:
 - a. Date - Substantial Completion / Start of Warranty
 - b. Owner / Architect
 - c. General Contractor
 - d. Roofing Sub-Contractor
 - e. Roof System Manufacturer
 - f. Description of roofing system / type
 - g. Warranty period / information

3.0 - EXECUTION

3.1 Mounting

- A. Provide Information Plaque with 3/32" mounting holes at opposite ends.
- B. Permanently attach to building features so as not to cause leaks at each distinguishable field area of new roof work. Preferably at the north or northeast perimeter edge; otherwise consult the Architect.
- C. Locate to be visible from atop the roof only and close to new work so as to not mistake the area being identified; 8" minimum above the finish roof surface.

END OF SECTION

1.0 - GENERAL

- 1.1 Scope
The work of this section consists of furnishing and installing complete, all miscellaneous furnishings and fixture items as indicated.
- 1.2 Submittals
Shop drawings shall be submitted.
- 1.3 Warranty
Provide Manufacturer's Standard Warranty where manufacturer warrants that the Goods delivered hereunder shall be of the kind described within this agreement and free from defects in material and workmanship under conditions of normal use for a period of six (6) years. Halotron, CO2 and Water/Water based extinguisher will be warrantied for a period of five (5) years.

2.0 - PRODUCTS

- 2.1 Fire Extinguisher Cabinets (FEC)
Recessed or semi-recess U.L. approved baked enamel 18 gauge steel cabinet, 24" h. x 10-1/2" w. x 6" d. with 2-1/2" trim. Cabinet door to be baked enamel or epoxy coated with stencil lettering "Fire Extinguisher" equal to J. L. Industries-Panorama #1017 Identity Q horizontal, white w/red letters - type break glass w/cly. lock; Larsen's Mfg. Co.; Amerex Corporation; or approved equal.

Provide comparable fire rated fire extinguisher cabinets in fire rated walls as per rating indicated.
- 2.2 Fire Extinguisher (FE)
 - A. Cabinet Mounted - U.L. approved, 10 pound, tri-class dry chemical for Class A, B, & C fires. Equal to J. L. Industries - Cosmic 10E with hose; Larsen's Mfg. Co.; Amerex Corporation. Provide one with each cabinet.
 - B. Wall Mounted - 10 pound, Tri-Class Dry Chemical for Class A, B, C fires, U.L. approved, Model 10 ABCS-1. Manufacturers: J.L. Industries, Larsens, Amerex Corporation.
 - C. Provide "K" type fire extinguishers at all kitchen locations.

3.0 - EXECUTION

- 3.1 Installation
Installation of all items shall be in full conformity with manufacturer's specifications, recommendations, ADA and approved details.
- 3.2 Fire Extinguishers shall be cabinet mounted in areas as indicated. Height shall be 4' from floor to extinguisher handles.
- 3.3 Fire Extinguishers shall be wall mounted in areas as indicated or required so that distance of travel between units does not exceed 75 feet. Each separate area shall have a minimum of one unit. Mounting height shall be 4' from floor to handle.

END OF SECTION

MISCELLANEOUS FURNISHINGS AND FIXTURES - SECTION 12150

1.0 - GENERAL

- 1.1 Scope
The work of this section consists of furnishing and installing complete, all miscellaneous furnishings, fixtures and signage items as indicated.
- 1.2 Submittals
Shop drawings shall be submitted.

2.0 - PRODUCTS

- 2.1 Building Letters
Cast aluminum letters, equal to Leeds Architectural Letters, Inc., Euro Roman Font, 12" High, lay-out as indicated. Colors as selected by Architect. Provide flush concealed stud mounting.
- 2.2 Building Plaque
- A. Dedication plaque shall be of cast aluminum. Furnish and install a 24" x 42" plaque with approximately 500 raised letters and raised border. Field shall have stipple finish. Face of letters and borders shall have ground satin finish surface.
 - B. Plaque layout and designation shall be furnished by the Architect.
- 2.3 Appliances
- A. Dishwasher - Provide at locations as indicated on drawings. Built-in Dishwasher to be in conformance with ADA counter height and as an equal to Whirlpool Model # WDF550SAFS. Provide all utility rough-ins and final hook-up in accordance with manufacturer's written instructions.
 - B. Washer and Dryer - Provide at locations as indicated on drawings. Washer equal to Milnor - Rigid Mount 30015VRJ. Dryer equal to Milnor M758V (Electric). Provide all utility rough-ins and final hook-up in accordance with manufacturer's written instructions. (See cut sheets at the end of this section).
 - 1. Under-counter Ice Machine - GE Appliances; Model #UCC15NJII
 - 2. See Electrical/Plumbing drawings and provide equipment with all required electrical and plumbing rough-ins, hook-ups and installations.
 - 3. Warranty: Provide manufacturer's 5 year warranty.
 - 4. Provide Operation/Maintenance Demonstration for Owner.
 - C. Washer/Dryer - Washer: Speed Queen -TR5 Product #TR5000WN;
 - 1. Model # AWN63RSN115TW01, 3.2 cu.ft. Dryer: Speed Queen - DR5 Product # DRS000WE;
 - 2. Model # ADE4BRGS175TW01; electric.
See Electrical/Plumbing drawings and provide equipment with all required electrical and plumbing rough-ins, hook-ups and installations.
 - 3. Warranty: Provide manufacturer's 5 year warranty.
 - 4. Provide Operation/Maintenance Demonstration for Owner.
 - D. Under-Counter Dishwasher - GE Appliances; Under-counter with hidden controls
 - 1. Model #GLDT696JSS
 - 2. See Electrical/Plumbing drawings and provide equipment with all required electrical and plumbing rough-ins, hook-ups and installations.
 - 3. Warranty: Provide manufacturer's 5 year warranty.
 - 4. Provide Operation/Maintenance Demonstration for Owner.

E. Slide-in Range: GE Appliances Model #JS7605LSS

1. See Electrical/Plumbing drawings and provide equipment with all required electrical and plumbing rough-ins, hook-ups and installations.
2. Warranty: Provide manufacturer's 5 year warranty.
3. Provide Operation/Maintenance Demonstration for Owner.

F. Dishwasher - Provide at locations as indicated on drawings. Built-in Dishwasher to be in conformance with ADA counter height and as an equal to Whirlpool Model # WDF550SAFS. Provide all utility rough-ins and final hook-up in accordance with manufacturer's written instructions.

2.4 Project Sign - Specification requirements are listed in Section 01030.

3.0 - EXECUTION

3.1 Installation

Installation of all items shall be in full conformity with manufacturer's specifications, recommendations and approved details.

3.2 Installation of Building Letters

Install building letters on surfaces and at heights as directed. Install in accordance with manufacturer's recommendations.

3.3 Installation of Plaque(s)

Install plaque(s) where directed.

END OF SECTION

1.0 – GENERAL

- 1.1 Section Includes
 - A. Fixed modular laminate clad casework and components.
 - B. Countertops.
 - C. Mobile storage units, tables and components.
- 1.2 Related Sections
 - A. Blocking within walls where indicated: Division 6.
 - B. Millwork, trim, and custom cabinetry: Division 6 and 12.
 - C. Glass: Division 8.
 - D. Base molding: Division 9.
 - E. Sinks and service fixtures, service waste lines, connections, and vents: Division 15.
 - F. Electrical service fixtures: Division 16.
- 1.3 Quality Assurance
 - A. Manufacturer: Minimum of 5 years' experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
 - B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.
 - C. All manufactured casework systems, countertops and related items herein specified shall be furnished by one contractor to insure single source responsibility, and integration with other building trades.
- 1.4 Submittals
 - A. Comply with Section 01350, unless otherwise indicated.
 - B. Product Data: Manufacturer's catalog with specifications and construction details.
 - C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
 - 1. Include production drawings for all casework systems and section drawings of all casework, work surfaces and accessories.
 - 2. Indicate locations of plumbing and electrical service field connection by others.
 - 3. Include layout with units in relation to surrounding walls, doors, windows, and other building components.

4. Coordinate production drawings with other work involved.

D. Casework Samples:

1. Component samples: Two sets of samples for each of the following:
Decorative laminate color charts / PVC and ABS edgings.

1.5 Product Handling

- A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.
- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.
- C. General Contractor shall be responsible for protection of all casework and tops after installation is complete.

1.6 Job Conditions

- A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
 1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
 2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.
- B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.
 1. Flooring required to be placed under casework and equipment must be installed prior to installation.
 2. Wood or metal blocking (wall grounds) shall be installed within partitions prior to delivery of casework and furnishings to allow for immediate installation on delivery.
 3. Walls and openings shall be plumb, straight and square. Concrete floors shall be level within acceptable trade tolerances. Specifically the floor must be within 1/8" of level per 10 foot run, non-accumulative, when tested with a straight edge in any one direction.
 4. All overhead mechanical, electrical or plumbing rough-in work shall be complete
 5. Ceiling grids (with or without ceiling tiles), overhead soffits, duct work and lighting shall be installed.
 6. Painting shall be complete.
 7. General Contractor shall provide a secure storage area within the building that is clean, dry, well ventilated, protected from direct sunlight and broom clean.

1.7 Warranty

All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

2.0 – PRODUCTS

2.1 Manufacturers:

- A. Manufacturer:
Casework shall be Stevens, Advanced Cabinet Systems or pre-approved equal. Each manufacturer must be able to provide casework (including selected plastic laminate colors) as specified and detailed in drawings and specifications.
- B. Substitutions:
 - 1. Casework of other manufacturers will be considered for pre-approval, providing written request is received and approved at least ten (10) days prior to announced bid date and approved by Addendum. Bidder shall state in writing any deviations from requirements and specifications. The casework shall conform to the configuration, arrangement, design, material quality, joinery, panel thickness, and surfacing of that specified and shown on drawings.
 - 2. Manufacturer must be Architectural Woodwork Institute (AWI) Premium Certified.
 - 3. Requests for product substitutions must comply with Section 01360 – Product Substitution Procedures.

2.2 Materials

- A. Core Materials:
 - 1. Particleboard up to 7/8 inch thick: Industrial Grade average 47-pound density particleboard, ANSI A 208.1-1999, M-3.
 - 2. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particle-board, ANSI A 208.1-1999, M-2.
 - 3. Medium Density Fiberboard 1/4 inch thick: Average 54-pound density grade, ANSI A208.2.
 - 4. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A208.1 1-1999, M-3.
- B. Decorative Laminates: GREENGAURD Indoor Air Quality Certified
 - 1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-2005.
 - 2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-2005.
 - 3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-2005.
 - 4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-2005.
 - 5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-2005.
 - 6. Thermally fused melamine laminate, NEMA Test LD 3-2005, color to be selected by architect.
- C. Laminate Color Selection: Nevamar, Wilson Art, Formica, Laminart, Arbonite, and Pionite are approved manufacturers. Manufacturer, colors, and pattern shall be selected from premium grade laminate and indicated on finish legend and schedule.

- D. Edging Materials:
1. 1mm PVC banding, machine applied; match laminate as schedule
 2. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius; match laminate as scheduled
- E. Glass:
1. Wall unit full sliding glass doors: 1/4 inch thick laminated safety glass.
 2. Glass insert doors, hinged or sliding wall cabinets: 1/4 inch thick laminated safety glass.
 3. Glass insert doors, hinged or sliding tall or base cabinets. 1/4 inch thick laminate safety glass.
 4. Sliding doors mounted in aluminum track.
 5. Trim glass inserts: Extruded rigid PVC channel and self-locking insert retainer strip.

2.3 Specialty Items

- A. Support Members:
1. Countertop support brackets: Epoxy powder coated, 11 gauge steel with integral cleat mount opening and wire management opening.
 2. Undercounter support frames: Epoxy powder coated.
 3. Legs: Epoxy powder coated.
 4. Brackets must support minimum of 600 lbs. without use of cross brace.

2.4 Cabinet Hardware

- A. Hinges:
1. 270-degree five knuckle - epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
 - a. Doors 48 inches and over in height have 3 hinges per door.
 - b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
 - c. Finish to be selected by Architect.
 - d. location for installation shall be noted on schedules on the drawings.
- B. Pulls:
- One pull shall be located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximize drawer slide life. Pull design shall comply with the Americans with Disability Act (ADA). Finish to be selected by Architect.
- a. Anodized aluminum wire pull, 8mm diameter with 96mm O.C. mounting holes
- C. Drawer Slides:
1. Regular, knee space and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature. Paper storage, 150-pound load rated epoxy coated steel slides.

2. File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.
- D. Adjustable Shelf Supports:
1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.
- E. Locks:
1. Removable core, disc tumbler, cam style lock with strike. Lock for sliding 3/4 inch thick doors is a disc type plunger lock, sliding door type with strike. Lock for sliding glass/acrylic doors is a ratchet type sliding showcase lock.
 2. Keying:

Keying as indicated on drawings shall be:
Alike Per Room & Master** (100 maximum combinations). Provide 2 Master keys to owner.
 3. Elbow catch or chain bolt used to secure inactive door on all locked cabinets.
- F. Sliding Door Track: Anodized aluminum double channel.
- G. Coat Rods: 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.
- H. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.
- I. Mirrors: 1/4 inch thick polished mirror plate.

2.5 Fabrication:

- A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown. Tall Cabinets: All wardrobe cabinets are to be 29" deep unless noted otherwise on architectural drawings
- B. All casework panel components must go through a supplemental sizing process after cutting, producing a panel precisely finished in size and squared to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.
- C. Cabinet Body Construction:
 1. All cabinet body construction shall be secured utilizing concealed interlocking mechanical fasteners. Construction must meet requirements in the AWS Manual, Edition 2, including errata through 2016 and appendix section.
 - a. Tops, bottoms and sides of all cabinets are particleboard core.
 - b. Tops, bottoms and sides of sink base units are moisture resistant particleboard core.

2. Cabinet backs: Minimum 1/4 inch thick particle board core (maximum of 1/2 inch thick particle board)
 - a. Exposed back on fixed: 3/4 inch thick particleboard with the exterior surface finished in VGS laminate as selected.
 - b. Exposed back on fixed: 3/4 inch thick moisture resistant particleboard with the exterior surface finished in VGS laminate as selected.
3. Cabinet base and tall units shall have a site-built toe base, constructed of 3/4-inch (minimum) lumber unless otherwise shown on the drawings. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawings.
4. Base units, except sink base units: Full sub-top. Sink base units are constructed of 3/4 inch moisture resistant particleboard and the base shelf shall be laminated both sides with cabinet liner.
5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
6. Exposed and semi exposed edges.
Edging: 1mm PVC.
7. Adjustable shelf core: 3/4 inch thick particleboard up to 36 inches wide, 1 inch thick particleboard over 36 inches wide.
Front edge: 1mm PVC.
8. Interior finish, units with open Interiors: (exposed areas)
 - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces that are exposed to receive thermally fused melamine to match exterior laminate.
 - b. Laminate color to be selected by architect.
9. Interior finish, units with closed Interiors:
 - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine to match other laminate.
 - b. Laminate color to be selected by architect.
10. Exposed ends:
Faced with VGS high-pressure decorative laminate.
11. Wall unit bottom:
Faced with thermally fused melamine laminate. (non-exposed areas only)
12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

- D. Drawers:
 - 1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 3mm PVC.
 - 2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
- E. Door/Drawer Fronts:
 - 1. Core: 3/4 inch thick moisture resistant particleboard at sink units.
 - 2. Provide double doors in opening in excess of 24 inches wide.
 - 3. Faces:
 - a. Exterior: VGS High-pressure decorative laminate.
 - b. Interior: High-pressure cabinet liner CLS.
 - c. All exposed areas to receive matching laminate color as face.
 - 4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.
- F. Miscellaneous Shelving:
 - 1. Core material: 3/4 inch or 1 inch thick particleboard.
 - 2. Exterior: VGS High-pressure decorative laminate.
 - 3. Edges: 3mm PVC (at open storage shelving on metal standards), external edges and outside corners machine profiled to 1/8 inch radius.

2.6 Decorative Laminate Countertops:

- A. All laminate clad countertops shown on drawings for fixed casework shall be constructed with minimum 1-1/6" solid particleboard, except at sink and wet areas.
 Furnish plywood core tops and splashes, two and a half feet each side of center line of all sinks. All tops shall be laminated on the top face with GP50 (.050) high pressure decorative laminate and shall also have BK20 backer sheet creating balanced construction. The plastic laminate tops required for the rail mounted casework shall be constructed the same as the fixed laminate tops in the lengths indicated on the drawings. The rail mounted tops mounted over brackets shall be 1-1/4 inches from the wall to create a continuous grommet behind the back of the top. The rail mounted tops shall be supplied with 3mm PVC on all four edges. Provide tight joint fasteners where needed. All exposed edges, including edges of backsplash where used, shall have 3mm PVC banding, machine applied with waterproof hot melt adhesive. Exposed edges and corners shall be machine profiled to 1/8" radius for safety. Edging shall be available in colors as listed in Specification. Furnish 4" high backsplashes behind all sinks and as indicated on architectural drawings.

3.0 - EXECUTION

3.1 Inspection

The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under

this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 Preparation

Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 Installation

- A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.
- C. Repair minor damage per plastic laminate manufacturer's recommendations.

3.4 Cleaning

- A. Remove and dispose of all packing materials and related construction debris.
- B. Clean cabinets inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

3.5 Color Selection:

Laminate Color Selection: See Finish Legend and Schedule for color selections.

END OF SECTION

ADDITION AND RENOVATIONS TO CAFETERIA AT SALTER ELEMENTARY SCHOOL TALLADEGA CITY BOARD OF EDUCATION

Mechanical

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Materials and Methods
Section 15145 - Hangers and Supports
Section 15183 - Refrigerant Piping
Section 15250 - Mechanical Insulation
Section 15820 - Duct Accessories
Section 15891 - Metal Ductwork
Section 15932 - Air Outlets and Inlets
Section 15990 - Testing, Adjusting and Balancing

Plumbing

Section 15010 - Basic Mechanical Requirements HVAC
Section 15050 - Basic Mechanical Materials and Methods
Section 15100 - Valves
Section 15145 - Hangers and Supports
Section 15150 - Sanitary Waste and Vent Piping
Section 15250 - Mechanical Insulation
Section 15411 - Water Distribution Piping
Section 15430 - Plumbing Specialties
Section 15440 - Plumbing Fixtures
Section 15488 - Natural Gas Piping System

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BASIC MECHANICAL REQUIREMENTS - SECTION 15010

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 and the other sections of Division 15.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Submittals.
 - 2. Coordination drawings.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Mechanical installations.
 - 7. Cutting and patching.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 15 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.
 - 2. Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 15, plus general related specifications including:
 - a. Access to mechanical installations.
 - b. Excavation for mechanical installations within the building boundaries, and from building to utilities connections.

1.3 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."
- B. Increase, by the quantity listed below, the number of mechanical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Mechanical Consulting Engineer.
 - 1. Shop Drawings - Initial Submittal: 1 additional blue- or black-line prints.
 - 2. Shop Drawings - Final Submittal: 1 additional blue- or black-line prints.
 - 3. Product Data: 1 additional copy of each item.
 - 4. Samples: 1 addition as set.
- C. Additional copies may be required by individual sections of these Specifications.

1.4 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate the

following installed conditions:

1. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
5. Contract Modifications, actual equipment and materials installed.

1.5 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:
 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions and lubrication charts and schedules.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS."
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 1. Uncover Work to provide for installation of ill-timed Work.
 2. Remove and replace defective Work.
 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 4. Remove samples of installed Work as specified for testing.
 5. Install equipment and materials in existing structures.
 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
2. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION 15010

BASIC MECHANICAL MATERIALS AND METHODS - SECTION 15050

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Escutcheons.
 - 4. Dielectric fittings.
 - 5. Flexible connectors.
 - 6. Mechanical sleeve seals.
 - 7. Equipment nameplate data requirements.
 - 8. Nonshrink grout for equipment installations.
 - 9. Field-fabricated metal and wood equipment supports.
 - 10. Installation requirements common to equipment specification sections.
 - 11. Mechanical demolition.
 - 12. Cutting and patching.
 - 13. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 15 piping system Sections.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination Drawings: For access panel and door locations.
- D. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 2. Clearances for installing and maintaining insulation.
 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 4. Equipment and accessory service connections and support details.
 5. Exterior wall and foundation penetrations.
 6. Fire-rated wall and floor penetrations.
 7. Sizes and location of required concrete pads and bases.
 8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
 9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- E. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning

requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

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:
 - 1. Dielectric Unions:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Eclipse, Inc.; Rockford-Eclipse Div.
 - d. Epco Sales Inc.
 - e. Hart Industries International, Inc.

- f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- 2. Dielectric Flanges:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Epco Sales Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- 3. Dielectric-Flange Insulating Kits:
 - a. Calpico, Inc.
 - b. Central Plastics Co.
- 4. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- 5. Dielectric Nipples:
 - a. Grinnell Corp.; Grinnell Supply Sales Co.
 - b. Perfection Corp.
 - c. Victaulic Co. of America.
- 6. Metal, Flexible Connectors:
 - a. ANAMET Industrial, Inc.
 - b. Central Sprink, Inc.
 - c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Grinnell Corp.; Grinnell Supply Sales Co.
 - f. Hyspan Precision Products, Inc.
 - g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
 - h. Mercer Rubber Co.
 - i. Metraflex Co.
 - j. Proco Products, Inc.
 - k. Uniflex, Inc.
- 7. Rubber, Flexible Connectors:
 - a. General Rubber Corp.
 - b. Mercer Rubber Co.
 - c. Metraflex Co.
 - d. Proco Products, Inc.
 - e. Red Valve Co., Inc.
 - f. Uniflex, Inc.
- 8. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
- F. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 FLEXIBLE CONNECTORS

- A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:
 1. 2-Inch NPS and Smaller: Threaded.
 2. 2-1/2-Inch NPS and Larger: Flanged.
 3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.
- B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
- C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose. Do not use for potable water.
- D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose. Do not use for potable water.

- E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated. Do not use for potable water unless units comply with NSF61.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 - 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. OD: Completely cover opening.
 - 3. Cast Brass: One piece, with set screw.
 - a. Finish: Polished chrome-plate.
 - 4. Cast Brass: Split casting, with concealed hinge and set screw.
 - a. Finish: Polished chrome-plate.
 - 5. Stamped Steel: One piece, with set screw and chrome-plated finish.
 - 6. Stamped Steel: One piece, with spring clips and chrome-plated finish.
 - 7. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
 - 8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
 - 9. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
 - 10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
 - 11. Cast-Iron Floor Plate: One-piece casting.

2.8 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
 - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 - 2. Location: Accessible and visible location.
- C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- E. Plastic Duct Markers: Manufacturer's standard color-coded, laminated plastic. Comply with the following color code:
 - 1. Green: Cold air.
 - 2. Yellow: Hot air.
 - 3. Yellow/Green or Green: Supply air.
 - 4. Blue: Exhaust, outside, return, and mixed air.
 - 5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
 - 6. Nomenclature: Include the following:
 - a. Direction of airflow.
 - b. Duct service.
 - c. Duct origin.
 - d. Duct destination.
 - e. Design cubic feet per meter.
- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
 - 1. Fabricate in sizes required for message.
 - 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
 - 3. Punch for mechanical fastening.
 - 4. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
 - 5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:
 - 1. Green: Cooling equipment and components.
 - 2. Yellow: Heating equipment and components.
 - 3. Yellow/Green: Combination cooling and heating equipment and components.
 - 4. Brown: Energy reclamation equipment and components.
 - 5. Blue: Equipment and components that do not meet any criteria above.
 - 6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
 - 7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
 1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.9 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psig, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: 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 at slope in accordance with related codes.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.

- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
 - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Permanent sleeves are not required for holes formed by PE removable sleeves.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.
 - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
 - 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 5. 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:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. 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.
 6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. PVC Pressure Piping: ASTM D 2672.
 - c. PVC Nonpressure Piping: ASTM D 2855.

- W. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
 2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
 - 1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.
 - 1. Location: In each space, if ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.
- D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.4 PAINTING AND FINISHING

- A. Apply paint to exposed piping according to the following, unless otherwise indicated:
 - 1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 - 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 - 3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 - 4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 - 5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 - 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

- A. Disconnect, demolish, and remove Work specified in Division 15 Sections.
- B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches (50 mm) beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.9 CUTTING AND PATCHING - ROOF/CURB PENETRATIONS

- A. The HVAC contractor shall not cut or penetrate the roof. Roofing contractor to make all roof penetrations and provide/install all curbs. Coordinate curb and roof penetrations needed with roofing contractor. Refer to roof curb specifications.

3.10 CUTTING AND PATCHING – GENERAL

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.11 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.

- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

PART 4 - HVAC EQUIPMENT

4.1 EXHAUST FANS

- A. Description: Fan shall be ceiling mounted, direct driven, centrifugal exhaust fan.
- B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- C. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation.
 - 1. The outlet duct shall have provision for an aluminum backdraft damper with continuous aluminum hinge rod.
 - 2. The inlet box shall be minimum 22-gauge galvanized steel.
 - 3. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet.
 - 4. A field wiring compartment with receptacle shall be standard.
 - 5. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided.
 - 6. A white, high impact styrene injection molded grill shall be provided as standard. Unit shall be designed with provision for field conversion from ceiling to in-line.
 - 7. Unit shall be shipped in ISTA certified transit tested packaging.
- D. Wheel: Wheel shall be centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.
- E. Motor: Motor shall be open drip proof type with permanently lubricated sealed bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage and phase.

4.2 REFRIGERANT PIPING AND ACCESSORIES

- A. General: Sized and installed in accordance with compressor manufacturer's recommendations. Material shall be soft copper. Joints, fitting, etc. shall be in accordance with manufacturer's recommendations.

4.3 HVAC EQUIPMENT

- A. HVAC equipment shall be in accordance with the manufacturer's standard equipment as listed and scheduled on the plans.

4.4 WARRANTIES

- A. Warranties shall begin at date of substantial completion. All compressors shall include minimum of five-year warranty. One year warranty for labor, parts, units, etc. is required for all equipment.

END OF SECTION 15050

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.
- F. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

- D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
 - 1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.
 - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Water: Potable.
 - 4. Packaging: Premixed and factory-packaged.

PART 3 – EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments

as required to properly support piping from building structure.

- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- I. Support fire protection systems piping independent of other piping.
- J. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Load Distribution: Install hangers and supports so that piping live and dead loading 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 that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- M. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

<u>NPS (Inches)</u>	<u>LENGTH (Inches)</u>	<u>THICKNESS (Inches)</u>
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

- 4. Pipes 8 Inches and Larger: Include wood inserts.

5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15145

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. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
 - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Hot-gas bypass valves.
 - 4. Filter dryers.
 - 5. Strainers.
 - 6. Pressure-regulating valves.
- 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. Shop Drawing Scale: 1/4 inch equals 1 foot.
 - 2. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 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.

1.9 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07720 "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L or ASTM B 280, Type ACR.
- 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 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.
- B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.
- C. Steel Flanges and Flanged Fittings: ASME B16.5, steel, including bolts, nuts, and gaskets, bevel-welded end connection, and raised face.
- D. 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.
- E. Flanged Unions:
 - 1. Body: Forged-steel flanges for NPS 1 to NPS 1-1/2 (DN 25 to DN 40) and ductile iron for NPS 2 to NPS 3 (DN 50 to DN 80). Apply rust-resistant finish at factory.
 - 2. Gasket: Fiber asbestos free.
 - 3. Fasteners: Four plated-steel bolts, with silicon bronze nuts. Apply rust-resistant finish at factory.
 - 4. End Connections: Brass tailpiece adapters for solder-end connections to copper tubing.
 - 5. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 - 6. Pressure Rating: Factory test at minimum 400 psig (2760 kPa).
 - 7. Maximum Operating Temperature: 330 deg F (165 deg C).
- F. Flexible Connectors:
 - 1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
 - 2. End Connections:
 - a. NPS 2 (DN 50) and Smaller: With threaded-end connections.
 - b. NPS 2-1/2 (DN 65) and Larger: With flanged-end connections.
 - 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).

2.3 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. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
 2. Packing: Molded stem, back seating, and replaceable under pressure.
 3. Operator: Rising stem.
 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
 5. Seal Cap: Forged-brass or valox hex cap.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Working Pressure Rating: 500 psig (3450 kPa).
 8. Maximum Operating Temperature: 275 deg F (135 deg C).
- C. 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).
- D. 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).
- E. 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 ac coil.
 6. Working Pressure Rating: 400 psig (2760 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
 8. Manual operator.
- F. 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: 400 psig (2760 kPa).
 6. Maximum Operating Temperature: 240 deg F (116 deg C).
- G. 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.
 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.
- H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 5. Seat: Polytetrafluoroethylene.
 6. Equalizer: Internal.
 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and ac coil.
 8. End Connections: Socket.
 9. Throttling Range: Maximum 5 psig (34 kPa).
 10. Working Pressure Rating: 500 psig (3450 kPa).
 11. Maximum Operating Temperature: 240 deg F (116 deg C).
- I. 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).
- J. 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).
- K. 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).
- L. 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 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina.
 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.
 8. Rated Flow: Based upon HVAC tons of refrigeration.
 9. Working Pressure Rating: 500 psig (3450 kPa).
 10. Maximum Operating Temperature: 240 deg F (116 deg C).
- M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina.
 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.
 8. Rated Flow: Based upon HVAC tons of refrigeration.
 9. Working Pressure Rating: 500 psig (3450 kPa).
 10. Maximum Operating Temperature: 240 deg F (116 deg C).
- N. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or flare.
 3. Working Pressure Rating: 500 psig (3450 kPa).
 4. Maximum Operating Temperature: 275 deg F (135 deg C).
- O. Receivers: Comply with ARI 495.
1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 2. Comply with UL 207; listed and labeled by an NRTL.
 3. Body: Welded steel with corrosion-resistant coating.
 4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
 5. End Connections: Socket or threaded.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- P. 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).

2.4 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: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- C. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
- D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:
1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 3. NPS 1-1/4 (DN 32) and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
 4. NPS 1-1/2 to NPS 2: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- F. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications NPS 2 to NPS 4 (DN 50 to DN 100): Schedule 40, black-steel and wrought-steel fittings with welded joints.
- G. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- H. Safety-Relief-Valve Discharge Piping: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- I. Safety-Relief-Valve Discharge Piping:
1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 3. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

- 4. NPS 1-1/2 to NPS 2: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- J. Safety-Relief-Valve Discharge Piping NPS 2 to NPS 4: Schedule 40, black-steel and wrought-steel fittings with welded joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and 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 and hot-gas bypass 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. Hot-gas bypass valves.
 - 4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install receivers sized to accommodate pump-down charge.
- M. 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 Section 15900 "HVAC Instrumentation and Controls" and Section 15940 "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 Section 08311 "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. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
1. Shot blast the interior of piping.
 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
 3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
 4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
 6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.
- R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- S. Identify refrigerant piping and valves according to Section 15077 "Identification for HVAC Piping and Equipment."
- T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 15093 "Sleeves and Sleeve Seals for HVAC Piping."
- U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 15093 "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 15098 "Escutcheons for HVAC Piping."

3.4 PIPE 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 pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: 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 BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Threaded Joints: Thread steel 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. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 15062 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. 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).
 4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 7. NPS 2-1/2 (DN 65): Maximum span, 108 inches (2700 mm); minimum rod size, 3/8 inch (9.5 mm).
 8. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (9.5 mm).
 9. NPS 4 (DN 100): Maximum span, 12 feet (3.7 m); minimum rod size, 1/2 inch (13 mm).
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (9.5 mm).
 2. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (9.5 mm).
 3. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (9.5 mm).
 4. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).

- E. Support multifloor 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, specialties, and receivers. 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 15183

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 pipe, duct, and equipment insulation.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 15 Section "Supports and Anchors" for pipe insulation shields and protection saddles.
 - 2. Division 15 Section "Metal Ductwork" for duct lining.

1.3 DEFINITIONS

- A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperatures less than 75 deg F.
- D. Thermal resistivity is designated by an r-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.
- E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.
- F. Density: Is expressed in pcf.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or

inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.6 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping and duct systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Glass Fiber:
 - a. CertainTeed Corporation.
 - b. Knauf Fiberglass GmbH.
 - c. Manville.
 - d. Owens-Corning Fiberglas Corporation.
 - e. USG Interiors, Inc. - Thermafiber Division.
 2. Cellular Glass:
 - a. Pittsburgh Corning Corporation.
 3. Flexible Elastomeric Cellular:
 - a. Armstrong World Industries, Inc.
 - b. Halstead Industrial Products.
 - c. IMCOA.
 - d. Rubatex Corporation.
 4. Calcium Silicate:
 - a. Manville.
 - b. Owens-Corning Corporation.

2.2 GLASS FIBER

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
- C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
 2. Density: 12 pcf average maximum.
- D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
- E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
 2. Density: 10 pcf average maximum.
- F. Adhesive: Produced under the UL Classification and Follow-up service.
1. Type: Non-flammable, solvent-based.
 2. Service Temperature Range: Minus 20 to 180 deg F.
- G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 CELLULAR GLASS

- A. Material: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
- B. Facing: ASTM C 921, Type 1, factory-applied, laminated foil, flame-retardant, vinyl facing.
- C. Form: The following as indicated:
1. Blocks: ASTM C 552, Type I.
 2. Boards: ASTM C 552, Type IV.
 3. Preformed Pipe: ASTM C 552, Type II, Class 2 (jacketed).
 4. Special Shapes: ASTM C 552, Type III, in shapes and thicknesses as indicated.
- D. Thermal Conductivity: 0.38 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
- E. Minimum Density: 7 pcf.
- F. Maximum Density: 9.5 pcf.

2.4 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
1. Tubular Materials: ASTM C 534, Type I.
 2. Sheet Materials: ASTM C 534, Type II.
- B. Thermal Conductivity: 0.30 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F.

- C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.5 CALCIUM SILICATE

- A. Material: ASTM C 533, Type I; inorganic, hydrous calcium silicate, non-asbestos fibrous reinforcement; incombustible.
- B. Form: Molded flat block, curved block, grooved block, and preformed pipe sections as appropriate for surface.
- C. Thermal Conductivity: 0.60 Btu x inch/h x sq. ft. x deg F at 500 deg F.
- D. Dry Density: 15.0 pcf maximum.
- E. Compressive Strength: 60 psi minimum at 5 percent deformation.
- F. Fire Performance Characteristics: Provide materials identical to those whose fire performance characteristics have been determined, per test method indicated below, by UL or other testing and inspecting organization acceptable to authorities having jurisdiction.
 - 1. Test Method: ASTM E 84.
 - 2. Flame Spread: 0.
 - 3. Smoke Developed: 0.

2.6 INSULATING CEMENTS

- A. Mineral Fiber: ASTM C 195.
 - 1. Thermal Conductivity: 1.0 Btu x inch/h x sq. ft. x deg F average maximum at 500 deg F mean temperature.
 - 2. Compressive Strength: 10 psi at 5 percent deformation.
- B. Expanded or Exfoliated Vermiculite: ASTM C 196.
 - 1. Thermal Conductivity: 1.10 Btu x inch/h x sq. ft. x deg F average maximum at 500 deg F mean temperature.
 - 2. Compressive Strength: 5 psi at 5 percent deformation.
- C. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.
 - 1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.
 - 2. Compressive Strength: 100 psi at 5 percent deformation.

2.7 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
 - 1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.8 JACKETS

- A. General: ASTM C 921, Type 1, except as otherwise indicated.
- B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
 1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
 2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.
- C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20 mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.
 1. Adhesive: As recommended by insulation manufacturer.
- D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil thick, high-impact, ultra-violet-resistant PVC.
 1. Adhesive: As recommended by insulation manufacturer.
- E. Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper, roll stock ready for shop or field cutting and forming to indicated sizes.
 1. Finish and Thickness: Smooth finish, 0.010 inch thick.
 2. Moisture Barrier: 1 mil, heat-bonded polyethylene and kraft paper.
 3. Elbows: Preformed 45-degree and 90-degree, short- and long-radius elbows, same material, finish, and thickness as jacket.
- F. Stainless-Steel Jacket: ASTM A 167, Type 304 or 316, 0.10 inch thick, No. 2B finish, and roll stock ready for shop or field cutting and forming to indicated sizes.
 1. Moisture Barrier: 1 mil, heat-bonded polyethylene and kraft paper.
 2. Elbows: Gore type, for 45-degree and 90-degree elbows in same material, thickness, finish as jackets.
 3. Jacket Bands: Stainless steel, Type 304, 3/4 inch wide.

2.9 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd..
 1. Tape Width: 4 inches.
 2. Cloth Standard: MIL-C-20079H, Type I.
 3. Tape Standard: MIL-C-20079H, Type II.
- B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
 1. Stainless Steel: Type 304, 0.020 inch thick.
 2. Galvanized Steel: 0.005 inch thick.
 3. Aluminum: 0.007 inch thick.
 4. Brass: 0.01 inch thick.
 5. Nickel-Copper Alloy: 0.005 inch thick.

- C. Wire: 14 gage nickel copper alloy, 16 gage, soft-annealed stainless steel, or 16 gage, soft-annealed galvanized steel.
- D. Corner Angles: 28 gage, 1 inch by 1 inch aluminum, adhered to 2 inches by 2 inches kraft paper.
- E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.10 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.
 - 1. Water Vapor Permeance: 0.08 perm maximum.
 - 2. Temperature Range: Minus 20 to 180 deg F.
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
 - 1. Water Vapor Permeance: 0.02 perm maximum.
 - 2. Temperature Range: Minus 50 to 250 deg F.
 - 3. Color: Aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.
- B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.
 - 1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

- A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Install insulation with smooth, straight, and even surfaces.
- F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

- G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
- I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
- J. Keep insulation materials dry during application and finishing.
- K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
 - 1. Fibrous glass ducts.
 - 2. Metal ducts with duct liner.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 5. Flexible connectors for ducts and pipes.
 - 6. Vibration control devices.
 - 7. Testing laboratory labels and stamps.
 - 8. Nameplates and data plates.
 - 9. Access panels and doors in air distribution systems.
 - 10. Fire protection piping systems.
 - 11. Sanitary drainage and vent piping.
 - 12. Drainage piping located in crawl spaces, unless indicated otherwise.
 - 13. Below grade piping.
 - 14. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
 - 15. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.3 PIPE INSULATION INSTALLATION, GENERAL

- A. Tightly butt longitudinal seams and end joints. Bond with adhesive.
- B. Stagger joints on double layers of insulation.
- C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.
- D. Apply insulation with a minimum number of joints.
- E. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
 - 3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
 - a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.

4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
 6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
- F. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.
- G. Exterior Wall Penetrations: For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor barrier coating.
- H. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer.
- I. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer.
- J. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.
- K. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
1. Use same material and thickness as adjacent pipe insulation.
 2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever ever is greater.
 3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
 4. Insulate elbows and tees smaller than 3 inches pipe size with premolded insulation.
 5. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.
 6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
- L. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 15 Section "Supports and Anchors." For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends.
1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 BELOW GROUND PIPE INSULATION INSTALLATION

- A. General: The following are additional requirements for insulation applied to piping installed below ground.

- B. Coat bore surfaces of insulation materials with insulating cement of type recommended by insulation manufacturer. Apply enough cement to fill surface cells. Do not use adhesives for this coating.
- C. Secure insulation with a minimum of 2 stainless-steel bands for each section of insulation.
- D. Terminate insulation at anchor blocks.
- E. Apply insulation continuously through sleeves and manholes, except as specified above for exterior wall penetrations.
- F. Finishing: Apply 3 coats of asphaltic mastic to a finish thickness of 3/16 inch over insulation materials. Apply 10 by 10 mesh glass cloth between coats. Overlap edges of glass cloth by 2 inches.

3.5 GLASS FIBER PIPE INSULATION INSTALLATION

- A. Bond insulation to pipe with lagging adhesive.
- B. Seal exposed ends with lagging adhesive.
- C. Seal seams and joints with vapor barrier compound.

3.6 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
 - 1. Miter cut materials to cover soldered elbows and tees.
 - 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.7 EQUIPMENT INSULATION INSTALLATION, GENERAL

- A. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.
- B. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.
- C. Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.
- D. Bevel insulation edges for cylindrical surfaces for tight joint.
- E. Secure sections of insulation in place with wire or bands spaced at 9 inches centers, except for flexible elastomeric cellular insulation.

- F. Protect exposed corners with corner angles under wires and bands.
- G. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- H. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.
- I. Finishing: Except for flexible elastomeric cellular insulation, apply 2 coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.

3.8 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

- A. Secure insulation with anchor pins and speed washers.
- B. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.
- C. Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.9 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

- A. Install sheets of the largest manageable size.
- B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.
- C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.10 DUCT INSULATION

- A. Install block and board insulation as follows:
 - 1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
 - 2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.
- B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
 - 1. Smaller Than 24 Inches: Bonding adhesive applied in 6 inches wide transverse strips on 12 inches centers.
 - 2. 24 Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
 - 3. Overlap joints 3 inches.
 - 4. Seal joints, breaks, and punctures with vapor barrier compound.

3.11 JACKETS

- A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3 inch wide butt strips at end joints.
 - 1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
- B. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.
- C. Install metal jacket with 2 inches overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel draw bands 12 inches on center and at butt joints.
- D. Install the PVC jacket with 1 inch overlap at longitudinal and butt joints and seal with adhesive.
- E. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2 inch overlap at joints. Embed glass cloth between (2) 1/16 inch thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

3.12 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.13 APPLICATIONS

- A. General: Materials and thicknesses are specified in schedules at the end of this Section.
- B. Interior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic cold water.
 - 2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
 - 3. Domestic hot water.
 - 4. Recirculated hot water.
 - 5. Sanitary drains for fixtures accessible to the disabled.
 - 6. Refrigerant suction.
 - 7. Hydronic piping
- C. Interior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic cold water.
 - 2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
 - 3. Domestic hot water.
 - 4. Recirculated hot water.
 - 5. Refrigerant suction.
 - 6. Hydronic piping

7. Condensate piping
- D. Exterior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 1. Domestic cold water.
 2. Storm water.
 3. Refrigerant suction.
 4. Hydronic piping (35 to 99 deg F).
- E. Exterior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 1. Domestic cold water.
 2. Storm water.
 3. Refrigerant suction.
 4. Hydronic piping (35 to 99 deg F).
- F. Equipment: Unless otherwise indicated, insulate the following indoor equipment:
 1. Domestic cold water equipment, tanks, and pumps.
 2. Domestic hot water equipment, tanks, and water heaters.
 3. Low temperature brine equipment, tanks, pumps, and heat exchangers, 0 deg F to 34 deg F.
 4. Chilled water equipment, tanks, pumps, and heat exchangers.
 5. Heating water equipment, tanks, pumps, and heat exchangers, 100 deg F to 250 deg F.
- G. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
 1. Interior concealed supply, return and outside air ductwork.
 2. Interior exposed supply, return and outside air ductwork.
 3. Exterior exposed supply and return ductwork.
 4. Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.

3.14 PIPE INSULATION SCHEDULES

- A. General: Abbreviations used in the following schedules include:
 1. Field-Applied Jackets: P - PVC, K - Foil and Paper, A - Aluminum, SS - Stainless Steel.
 2. Pipe Sizes: NPS - Nominal Pipe Size.
- B. Domestic Cold Water, Condensate, and Storm Water All Sizes (Interior): 1/2 inch thick flexible elastomeric insulation. Field-applied jacket is not required.

INTERIOR DOMESTIC HOT WATER AND RECIRCULATED HOT WATER

<u>PIPE SIZES</u> <u>(NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS</u> <u>IN INCHES</u>	<u>VAPOR</u> <u>BARRIER</u> <u>REQ'D</u>	<u>FIELD-</u> <u>APPLIED</u> <u>JACKET</u>
1/2 TO 1	FLEXIBLE ELASTOMERIC	1.0	NO	NONE
1-1/4 TO 6	FLEXIBLE ELASTOMERIC	1.5	NO	NONE

SANITARY DRAINS AND TRAPS EXPOSED AT FIXTURES FOR DISABLED - REFERENCE PLUMBING PLANS.

INTERIOR REFRIGERANT SUCTION AND DUAL-TEMP CHILLED/HOT WATER (35 TO 100 DEG F) EXPOSED AND CONCEALED

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	1	YES	NONE
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	1	YES	NONE

EXTERIOR REFRIGERANT SUCTION AND DUAL-TEMP HYDRONIC AND CHILLED/HOT WATER (35 TO 100 DEG F) EXPOSED AND CONCEALED

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	GLASS FIBER FLEXIBLE ELASTOMERIC	2 1	YES YES	(A) NONE
1-1/2 TO 8	GLASS FIBER FLEXIBLE ELASTOMERIC	2-1/2 1	YES YES	(A) NONE

3.15 EQUIPMENT INSULATION SCHEDULES

INTERIOR EXPOSED DOMESTIC COLD WATER EQUIPMENT, TANKS, AND PUMPS

<u>MATERIAL</u>	<u>FORM</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
FLEXIBLE ELASTOMERIC	SHEET	1	YES	NONE

3.16 DUCT SYSTEMS INSULATION SCHEDULE - REFERENCE HVAC PLANS, HVAC NOTES

END OF SECTION 15250

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
1. Backdraft dampers.
 2. Manual-volume dampers.
 3. Fire and smoke dampers.
 4. Duct silencers.
 5. Turning vanes.
 6. Duct-mounted access doors and panels.
 7. Flexible ducts.
 8. Flexible connectors.
 9. Duct accessory hardware.

1.3 SUBMITTALS

- A. Product Data: For the following:
1. Backdraft dampers.
 2. Manual-volume dampers.
 3. Fire and smoke dampers.
 4. Duct silencers.
 5. Duct-mounted access doors and panels.
 6. Flexible ducts.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:
1. Special fittings and manual- and automatic-volume-damper installations.
 2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.
- C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- C. Aluminum Sheets: ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.
- D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installations.
- B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.
- C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.
- D. Blade Seals: Felt.
- E. Blade Axles: Galvanized steel.
- F. Tie Bars and Brackets: Galvanized steel.
- G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

- A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
 - 1. Pressure Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch thick,

- with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
- 2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized, sheet steel.
- 3. Blade Axles: Galvanized steel.
- 4. Tie Bars and Brackets: Galvanized steel.

2.4 FIRE DAMPERS

- A. General: Labeled to UL 555.
- B. Fire Rating: One and one-half hours.
- C. Frame: SMACNA Type A with blades in airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
 - 1. Minimum Thickness: 0.052 inch or 0.138 inch thick as indicated, and length to suit application.
 - 2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized steel blade connectors.
- H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.
- I. Fusible Link: Replaceable, 165 rated.

2.5 CEILING FIRE DAMPERS

- A. General: Labeled to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- B. Frame: 0.040-inch- thick, galvanized, sheet steel; round or rectangular; style to suit ceiling construction.
- C. Blades: 0.034-inch- thick, galvanized, sheet steel with nonasbestos refractory insulation.
- D. Fusible Link: Replaceable, 165 deg F rated.

2.6 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for

mounting in ducts.

- C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.7 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class.
- B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.8 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- C. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.

2.9 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts, Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.
- C. Flexible Ducts, Uninsulated: Corrugated aluminum.
- D. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- thick, glass-fiber insulation around a continuous inner liner.
 - 1. Reinforcement: Steel-wire helix encapsulated in inner liner.
 - 2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
 - 3. Inner Liner: Polyethylene film.
- E. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

2.10 ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.
- B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.
- D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
 - 1. Install fusible links in fire dampers.
- E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.
 - 1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
 - 2. Install access panels on side of duct where adequate clearance is available.

3.2 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 15820

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.
- B. Requirements of the following Division 15 Sections apply to this section:
 - 1. "Basic Mechanical Requirements."
 - 2. "Basic Mechanical Materials and Methods."

1.2 SUMMARY

- A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 2 inches to plus 10 inches water gage.

1.3 DEFINITIONS

- A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
 - 1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
 - 2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:
 - 1. Sealing Materials.
 - 2. Fire-Stopping Materials.

- C. Shop drawings from duct fabrication shop, drawn to a scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as the Contract Drawings, detailing:
 - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
 - 2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust ducts systems, indicate the classification of the materials handled as defined in this Section.
 - 3. Fittings.
 - 4. Reinforcing details and spacing.
 - 5. Seam and joint construction details.
 - 6. Penetrations through fire-rated and other partitions.
 - 7. Terminal unit, coil, and humidifier installations.
 - 8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- D. Welding certificates including welding procedures specifications, welding procedures qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.
- E. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 1.
- F. Maintenance data for volume control devices, fire dampers, and smoke dampers, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 1.

1.6 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."
- B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.
- C. NFPA Compliance: Comply with the following NFPA Standards:
 - 1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.
- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
- C. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- D. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 SEALING MATERIALS

- A. Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive or mastic nature, but also includes tapes and combinations of open weave fabric strips and mastics.
- B. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.
- C. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 FIRE-STOPPING

- A. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 - 2. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 - 3. "RTV 7403"; General Electric Co.
 - 4. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.4 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

- B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.
 - 1. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
 - 1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
 - 2. For stainless steel ducts, provide stainless steel support materials.
 - 3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.5 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
 - 1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 - 2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
 - 1. Supply Ducts: 3 inches water gage.
 - 2. Return Ducts: 2 inches water gage, negative pressure.
 - 3. Exhaust Ducts: 2 inches water gage, negative pressure.
- C. Crossbreaking or Cross Beading: Crossbreak or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.6 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1985 Edition, Figures 2-1 through 2-10.

2.7 ROUND AND FLAT OVAL DUCT FABRICATION

- A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet. Insulate all round duct with 1 1/2" external wrap insulation.

- B. Round Ducts: Fabricate round supply ducts with spiral lockseam construction, except where diameters exceed 72 inches. Fabricate ducts having diameters greater than 72 inches with longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- C. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figure 3-1, RL-1, RL-4, or RL-5. Seams Types RL-2 or RL-3 may be used if spot-welded on 1-inch intervals. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- D. Flat Oval Ducts: Fabricate flat oval supply ducts with standard spiral lockseams (without intermediate ribs) or with butt-welded longitudinal seams in gages listed in SMACNA "HVAC Duct Construction Standards," Table 3-4.

2.8 ROUND AND FLAT OVAL SUPPLY AND EXHAUST FITTINGS FABRICATION

- A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
 - 1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.
 - a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards," Table 3-1.
 - b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:
 - 1) 3 to 26 inches: 24 gage.
 - 2) 27 to 36 inches: 22 gage.
 - 3) 37 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - c. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:
 - 1) 3 to 14 inches: 24 gage.
 - 2) 15 to 26 inches: 22 gage.
 - 3) 27 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - d. Flat Oval Mitered Elbows: Solid welded and with the same metal thickness as longitudinal seam flat oval duct.
 - e. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.

2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.
3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.
4. Round Elbows - Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.
5. Die-Formed Elbows for Sizes Through 8 Inches and All Pressures: 20 gage with 2-piece welded construction.
6. Round Gored Elbows Gages: Same as for nonelbow fittings specified above.
7. Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.
8. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches: 26 gage.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.
- B. Install ducts with the fewest possible joints.
- C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
- H. Install insulated ducts with 1-inch clearance outside of insulation.
- I. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

3.2 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints as follows:
- B. Pressure Classifications Greater Than 3 Inches Water Gage: All transverse joints, longitudinal seams, and duct penetrations.
- C. Pressure Classification 2 and 3 Inches Water Gage: All transverse joints and longitudinal seams.
 - 1. Pressure Classification Less than 2 Inches Water Gage: Transverse joints only.
- D. Seal externally insulated ducts prior to insulation installation.

3.3 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.
- E. Install concrete insert prior to placing concrete.
- F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 MINIMUM FASTENERS

- A. Round metallic ducts shall be mechanically fastened by means of at least three sheet metal screws or rivets spaced equally around the joint.

Exception: Where a duct connection is made that is partially inaccessible, three screws or rivets shall be equally spaced on the exposed portion so as to prevent a hinge effect.

3.5 CONNECTIONS

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 15 Section "Duct Accessories."
- B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.
- C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.
- D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figure 2-19.

3.6 FIELD QUALITY CONTROL

- A. The Owner will contract with an independent testing agency to perform, record, and report leakage tests.
- B. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage.

3.7 ADJUSTING AND CLEANING

- A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 15 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.
- B. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION 15891

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 air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of outlets and inlets required for project include the following:
 - 1. Ceiling air diffusers.
 - 2. Wall registers and grilles.
 - 3. Louvers.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
 - 2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
 - 3. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
 - 4. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
 - 5. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
 - 1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
 - 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
 - 3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses; throw and drop; and noise criteria ratings. Indicate selections on data.

- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.
- C. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- D. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on diffuser schedule.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering diffusers which may be incorporated in the work include, but are not limited to, the following:
 - 1. Anemostat Products Div.; Dymanics Corp. of America.
 - 2. Cranes Co.; Div. of Wehr Corp.
 - 3. Krueger Mfg. Co.
 - 4. Titus Products Div.; Philips Industries, Inc.
 - 5. Tuttle & Bailey; Div. of Interpace Corp.

2.2 WALL REGISTERS AND GRILLES

- A. General: Except as otherwise indicated, provide manufacturer's standard wall registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide wall registers and grilles that have, as minimum, temperature and velocity

traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.

- C. Wall Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction which will contain each type of wall register and grille.
- D. Types: Provide wall registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering registers and grilles which may be incorporated in the work include, but are not limited to, the following:
 - 1. Anemostat Products Div.; Dynamics Corp. of America.
 - 2. Carnes Co.; Div. of Wehr Corp.
 - 3. Titus Products Div.; Philips Industries, Inc.

2.3 LOUVERS

- A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide louvers that have minimum free area, and maximum pressure drop of each type as listed in manufacturer's current data, complying with louver schedule.
- C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.
- D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners.
- E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering louvers which may be incorporated in the work include, but are not limited to, the following:
 - 1. Airline Products Co.
 - 2. Airolite Co.
 - 3. American Warming & Ventilating Inc.
 - 4. Arrow United Industries, Inc.
 - 5. Construction Specialties, Inc.
 - 6. Dowco Corp.
 - 7. Industrial Louvers, Inc.
 - 8. Louvers & Dampers, Inc.
 - 9. Penn Ventilator Co., Inc.
 - 10. Ruskin Mfg. Co.
 - 11. Safe-Air Inc.
 - 12. Snyder (E.G.) Co., Inc.
 - 13. Vent Products Co., Inc.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
- C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

3.3 SPARE PARTS

- A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION 15932

TESTING, ADJUSTING, AND BALANCING - SECTION 15990

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 specifies the requirements and procedures total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- B. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems, all pressure ranges; including variable volume and double duct systems;
 - 2. Return air systems;
 - 3. Exhaust air systems;
 - 4. Hydronic systems;
 - 5. Verify temperature control system operation.
- C. Test systems for proper sound and vibration levels.
- D. This Section does not include:
 - 1. Specifications for materials for patching mechanical systems;
 - 2. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.

1.3 DEFINITIONS

- A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
 - 1. the balance of air and water distribution;
 - 2. adjustment of total system to provide design quantities;
 - 3. electrical measurement;
 - 4. verification of performance of all equipment and automatic controls;
 - 5. sound and vibration measurement.
- B. Test: To determine quantitative performance of equipment.
- C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
- D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

- E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- F. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- H. Main: Duct or pipe containing the system's major or entire fluid flow.
- I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
- J. Branch main: Duct or pipe serving two or more terminals.
- K. Branch: Duct or pipe serving a single terminal.

1.4 SUBMITTALS

- A. Agency Data:
 - 1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.
- B. Engineer and Technicians Data:
 - 1. Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.
- C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
- D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems. Include this information in maintenance data specified in Division 1 and Section 15010.
- E. Sample Forms: Submit sample forms, if other than those standard forms prepared by the NEBB are proposed.
- F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
 - 1. Draft reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports.
 3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary
 - b. Air Systems
 - c. Hydronic Systems
 - d. Temperature Control Systems
 - e. Special Systems
 - f. Sound and Vibration Systems
 4. Report Contents: Provide the following minimum information, forms and data:
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.
 - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.
 - c. **Test and balance shall include complete coil performance for each operating mode (heating, cooling, and dehumidification). Coil performance shall include entering and leaving coil temperatures (db/wb).**
- G. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.5 QUALITY ASSURANCE

A. PRE-QUALIFIED CONTRACTORS FOR THIS ROLE.

1. Superior Test & Balance, Inc. (AABC)
1545 Gulf Shores Parkway, PMB #294
Gulf Shores, AL 36542
Tel: 251.317.3088
2. Systems Analysis, Inc. (AABC & NEBB)
217 Oxmoor Circle
Birmingham, AL 35209
Tel: 205.802.7850
3. National True-Test, Inc. (NEBB)
5757 Carrington Lake Parkway
Trussville, AL 35173
Tel: 205.681.9050

4. Environmental Testing Service, Inc. (NEBB)
150 Highway 216
Montevallo, AL 35115
Tel: (205) 476-8640
- B. Any Test & Balance Contractors not listed above must be requested and approved in writing ten (10) days prior to the bid.
- C. Agency Qualifications:
 1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
 2. The independent testing, adjusting, and balancing agency certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, and having at least one Professional Engineer registered in the State in which the services are to be performed, certified by NEBB as a Test and Balance Engineer.
- D. Codes and Standards:
 1. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
 2. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.
- E. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.6 PROJECT CONDITIONS

- A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.7 SEQUENCING AND SCHEDULING

- A. Test, adjust, and balance the air systems before hydronic, steam, and refrigerant systems.
- B. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F (3 degs C) wet bulb temperature of maximum summer design condition, and within 10 deg F (6 deg C) dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

A. Before operating the system, perform these steps:

1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
3. Compare design to installed equipment and field installations.
4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
5. Check filters for cleanliness.
6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
7. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.
8. Determine best locations in main and branch ductwork for most accurate duct traverses.
9. Place outlet dampers in the full open position.
10. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
11. Lubricate all motors and bearings.
12. Check fan belt tension.
13. Check fan rotation.

3.2 PRELIMINARY PROCEDURES FOR HYDRONIC SYSTEM BALANCING

A. Before operating the system perform these steps:

1. Open valves to full open position. Close coil bypass valves.
2. Remove and clean all strainers.
3. Examine hydronic systems and determine if water has been treated and cleaned.
4. Check pump rotation.
5. Clean and set automatic fill valves for required system pressure.
6. Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
7. Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).
8. Set temperature controls so all coils are calling for full flow.
9. Check operation of automatic bypass valves.
10. Check and set operating temperatures of chillers to design requirements.
11. Lubricate all motors and bearings.

3.3 MEASUREMENTS

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all reading with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- I. Take measurements in the system where best suited to the task.

3.4 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.
- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.5 TESTING FOR SOUND AND VIBRATION

- A. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

3.6 RECORD AND REPORT DATA

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.7 DEMONSTRATION

- A. Training:

1. Train the Owner's maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Review with the Owner's personnel, the information contained in the Operating and Maintenance Data specified in Division 1 and Section 15010.
2. Schedule training with Owner through the Architect/Engineer with at least 7 days prior notice.

END OF SECTION 15990

BASIC MECHANICAL REQUIREMENTS - SECTION 15010

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 and the other sections of Division 15.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Submittals.
 - 2. Coordination drawings.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Mechanical installations.
 - 7. Cutting and patching.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 15 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.
 - 2. Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 15, plus general related specifications including:
 - a. Access to mechanical installations.
 - b. Excavation for mechanical installations within the building boundaries, and from building to utilities connections.

1.3 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."
- B. Increase, by the quantity listed below, the number of mechanical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Mechanical Consulting Engineer.
 - 1. Shop Drawings - Initial Submittal: 1 additional blue- or black-line prints.
 - 2. Shop Drawings - Final Submittal: 1 additional blue- or black-line prints.
 - 3. Product Data: 1 additional copy of each item.
 - 4. Samples: 1 addition as set.
- C. Additional copies may be required by individual sections of these Specifications.

1.4 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate the

following installed conditions:

1. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
5. Contract Modifications, actual equipment and materials installed.

1.5 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS."
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 1. Uncover Work to provide for installation of ill-timed Work.
 2. Remove and replace defective Work.
 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 4. Remove samples of installed Work as specified for testing.
 5. Install equipment and materials in existing structures.
 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
2. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION 15010

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Escutcheons.
 - 4. Dielectric fittings.
 - 5. Flexible connectors.
 - 6. Mechanical sleeve seals.
 - 7. Equipment nameplate data requirements.
 - 8. Nonshrink grout for equipment installations.
 - 9. Field-fabricated metal and wood equipment supports.
 - 10. Installation requirements common to equipment specification sections.
 - 11. Mechanical demolition.
 - 12. Cutting and patching.
 - 13. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 15 piping system Sections.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination Drawings: For access panel and door locations.
- D. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 2. Clearances for installing and maintaining insulation.
 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 4. Equipment and accessory service connections and support details.
 5. Exterior wall and foundation penetrations.
 6. Fire-rated wall and floor penetrations.
 7. Sizes and location of required concrete pads and bases.
 8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
 9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- E. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning

requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

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:
 - 1. Dielectric Unions:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Eclipse, Inc.; Rockford-Eclipse Div.
 - d. Epco Sales Inc.
 - e. Hart Industries International, Inc.

- f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- 2. Dielectric Flanges:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Epco Sales Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- 3. Dielectric-Flange Insulating Kits:
 - a. Calpico, Inc.
 - b. Central Plastics Co.
- 4. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- 5. Dielectric Nipples:
 - a. Grinnell Corp.; Grinnell Supply Sales Co.
 - b. Perfection Corp.
 - c. Victaulic Co. of America.
- 6. Metal, Flexible Connectors:
 - a. ANAMET Industrial, Inc.
 - b. Central Sprink, Inc.
 - c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Grinnell Corp.; Grinnell Supply Sales Co.
 - f. Hyspan Precision Products, Inc.
 - g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
 - h. Mercer Rubber Co.
 - i. Metraflex Co.
 - j. Proco Products, Inc.
 - k. Uniflex, Inc.
- 7. Rubber, Flexible Connectors:
 - a. General Rubber Corp.
 - b. Mercer Rubber Co.
 - c. Metraflex Co.
 - d. Proco Products, Inc.
 - e. Red Valve Co., Inc.
 - f. Uniflex, Inc.
- 8. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
- F. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements: Manufacturer's standard solvent cements for the following:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 4. PVC to ABS Piping Transition: ASTM D 3138.
- I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 FLEXIBLE CONNECTORS

- A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:
 1. 2-Inch NPS and Smaller: Threaded.
 2. 2-1/2-Inch NPS and Larger: Flanged.
 3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.
- B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
- C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose. Do not use for potable water.
- D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose. Do not use for potable water.

- E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated. Do not use for potable water unless units comply with NSF61.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 2. OD: Completely cover opening.
 3. Cast Brass: One piece, with set screw.
 - a. Finish: Polished chrome-plate.
 4. Cast Brass: Split casting, with concealed hinge and set screw.
 - a. Finish: Polished chrome-plate.
 5. Stamped Steel: One piece, with set screw and chrome-plated finish.
 6. Stamped Steel: One piece, with spring clips and chrome-plated finish.
 7. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
 8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
 9. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
 10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
 11. Cast-Iron Floor Plate: One-piece casting.

2.8 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 2. Location: Accessible and visible location.
- C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- E. Plastic Duct Markers: Manufacturer's standard color-coded, laminated plastic. Comply with the following color code:
1. Green: Cold air.
 2. Yellow: Hot air.
 3. Yellow/Green or Green: Supply air.
 4. Blue: Exhaust, outside, return, and mixed air.
 5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
 6. Nomenclature: Include the following:
 - a. Direction of airflow.
 - b. Duct service.
 - c. Duct origin.
 - d. Duct destination.
 - e. Design cubic feet per meter.
- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
1. Fabricate in sizes required for message.
 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
 3. Punch for mechanical fastening.
 4. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
 5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:
1. Green: Cooling equipment and components.
 2. Yellow: Heating equipment and components.
 3. Yellow/Green: Combination cooling and heating equipment and components.
 4. Brown: Energy reclamation equipment and components.
 5. Blue: Equipment and components that do not meet any criteria above.
 6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
 7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
 1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.9 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psig, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: 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 at slope in accordance with related codes.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.

- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
 - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Permanent sleeves are not required for holes formed by PE removable sleeves.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.
 - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
 - 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

- R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 5. 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:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. 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.
 6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. PVC Pressure Piping: ASTM D 2672.
 - c. PVC Nonpressure Piping: ASTM D 2855.

W. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
 2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
 - 1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 - 2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.
 - 1. Location: In each space, if ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.
- D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.4 PAINTING AND FINISHING

- A. Apply paint to exposed piping according to the following, unless otherwise indicated:
 - 1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 - 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 - 3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 - 4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 - 5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
 - 6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- B. Do not paint piping specialties with factory-applied finish.
- C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

- A. Disconnect, demolish, and remove Work specified in Division 15 Sections.
- B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.
- D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches (50 mm) beyond face of adjacent construction. Cap and patch surface to match existing finish.
- E. Removal: Remove indicated equipment from Project site.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.9 CUTTING AND PATCHING - ROOF/CURB PENETRATIONS

- A. The HVAC contractor shall not cut or penetrate the roof. Roofing contractor to make all roof penetrations and provide/install all curbs. Coordinate curb and roof penetrations needed with roofing contractor. Refer to roof curb specifications.

3.10 CUTTING AND PATCHING - GENERAL

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.11 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.

- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

PART 4 - HVAC EQUIPMENT

4.1 EXHAUST FANS

- A. Description: Fan shall be ceiling mounted, direct driven, centrifugal exhaust fan.
- B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- C. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation.
 - 1. The outlet duct shall have provision for an aluminum backdraft damper with continuous aluminum hinge rod.
 - 2. The inlet box shall be minimum 22-gauge galvanized steel.
 - 3. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet.
 - 4. A field wiring compartment with receptacle shall be standard.
 - 5. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided.
 - 6. A white, high impact styrene injection molded grill shall be provided as standard. Unit shall be designed with provision for field conversion from ceiling to in-line.
 - 7. Unit shall be shipped in ISTA certified transit tested packaging.
- D. Wheel: Wheel shall be centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.
- E. Motor: Motor shall be open drip proof type with permanently lubricated sealed bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage and phase.

4.2 REFRIGERANT PIPING AND ACCESSORIES

- A. General: Sized and installed in accordance with compressor manufacturer's recommendations. Material shall be soft copper. Joints, fitting, etc. shall be in accordance with manufacturer's recommendations.

4.3 HVAC EQUIPMENT

- A. HVAC equipment shall be in accordance with the manufacturer's standard equipment as listed and scheduled on the plans.

4.4 WARRANTIES

- A. Warranties shall begin at date of substantial completion. All compressors shall include minimum of five-year warranty. One year warranty for labor, parts, units, etc. is required for all equipment.

END OF SECTION 15050

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 general duty valves common to several mechanical piping systems.

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 valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.
- C. Maintenance data for valves to include in the operation and maintenance manual. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- B. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set globe and gate valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gate Valves:

- a. Crane Company; Valves and Fitting Division.
- b. Hammond Valve Corporation.
- c. Kitz Corp. of America.
- d. Lunkenheimer/Cincinnati Valve Co.
- e. Milwaukee Valve Company, Inc.
- f. NIBCO Inc.
- g. Powell: Wm. Powell Company (The).
- h. Red-White Valve Corp.
- i. Stockham Valves & Fittings, Inc.

2. Ball Valves:

- a. Conbraco Industries, Inc.; Apollo Division.
- b. Hammond Valve Corporation.
- c. Milwaukee Valve Company, Inc.
- d. NIBCO Inc.
- e. Stockham Valves & Fittings, Inc.
- f. Tyler Pipe.
- g. Victaulic Company of America.

3. Plug Valves:

- a. Grinnell Corp.
- b. Huber: J.M. Huber Corp.; Flow Control Division (Resun Valves).
- c. NIBCO Inc.
- d. Stockham Valves & Fittings, Inc.
- e. Victaulic Company of America.

4. Globe Valves:

- a. Crane Company; Valves and Fitting Division.
- b. Hammond Valve Corporation.
- c. Kitz Corp. of America.
- d. Lunkenheimer/Cincinnati Valve Co.
- e. Milwaukee Valve Company, Inc.
- f. NIBCO Inc.
- g. Powell: Wm. Powell Company (The).
- h. Red-White Valve Corp.
- i. Stockham Valves & Fittings, Inc.

5. Butterfly Valves:

- a. Center Line, Mark Controls Corporation.
- b. Crane Company; Valves and Fitting Division.
- c. General Signal; DeZurik Unit.

- d. Grinnell Corp.
 - e. Hammond Valve Corporation.
 - f. Keystone Valve USA, Inc.
 - g. Milwaukee Valve Company, Inc.
 - h. NIBCO Inc.
 - i. Red-White Valve Corp.
 - j. Stockham Valves & Fittings, Inc.
 - k. Tyler Pipe.
 - l. Ultraflo Corporation.
 - m. Victaulic Company of America.
6. Swing Check Valves:
- a. Cla-Val Co.
 - b. Crane Company; Valves and Fitting Division.
 - c. Hammond Valve Corporation.
 - d. Kitz Corp. of America.
 - e. Lunkenheimer/Cincinnati Valve Co.
 - f. Milwaukee Valve Company, Inc.
 - g. NIBCO Inc.
 - h. Powell: Wm. Powell Company (The).
 - i. Red-White Valve Corp.
 - j. Stockham Valves & Fittings, Inc.
 - k. Victaulic Company of America.
7. Wafer Check Valves:
- a. Cla-Val Co.
 - b. Conbraco Industries, Inc.; Apollo Division.
 - c. Hammond Valve Corporation.
 - d. Keystone Valve USA, Inc.
 - e. Kitz Corp. of America.
 - f. Metraflex Company.
 - g. Milwaukee Valve Company, Inc.
 - h. NIBCO Inc.
 - i. Red-White Valve Corp.
 - j. Stockham Valves & Fittings, Inc.
 - k. Tyler Pipe.
 - l. Val-Matic Valve & Mfg. Corp.
 - m. Victaulic Company of America.
8. Lift Check Valves:
- a. Crane Company; Valves and Fitting Division.
 - b. Kitz Corp. of America.
 - c. Milwaukee Valve Company, Inc.
 - d. NIBCO Inc.
 - e. Powell: Wm. Powell Company (The).
 - f. Red-White Valve Corp.
 - g. Stockham Valves & Fittings, Inc.

2.2 BASIC, COMMON FEATURES

- A. Design: Rising stem or rising outside screw and yoke stems, except as specified below.
- 1. Nonrising stem valves may be used only where headroom prevents full extension of rising stems.

- B. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Use specified operators and handwheels, except provide the following special operator features:
 - 1. Handwheels: For valves other than quarter turn.
 - 2. Lever Handles: For quarter-turn valves 6 inches and smaller, except for plug valves, which shall have square heads. Furnish Owner with 1 wrench for every 10 plug valves.
 - 3. Chain-Wheel Operators: For valves 4 inches and larger, installed 96 inches or higher above finished floor elevation.
 - 4. Gear-Drive Operators: For quarter-turn valves 8 inches and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. Threads: ASME B1.20.1.
- H. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.
- I. Solder Joint: ASME B16.18.
 - 1. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

2.3 GATE VALVES

- A. Gate Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.
- B. Gate Valves, 3 Inches and Larger: MSS SP-70, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bonnet, solid cast-iron wedge, brass-alloy stem, outside screw and yoke, teflon- impregnated packing with 2-piece packing gland assembly, flanged end connections; and with cast- iron handwheel.

2.4 BALL VALVES

- A. Ball Valves, 4 Inches and Smaller: MSS SP-110, Class 150, 600-psi CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and conventional port for 3/4-inch valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections:
 - 1. Operator: Steel handwheel.
 - 2. Operator: Vinyl-covered steel lever handle.
 - 3. Operator: Vinyl-covered steel tee handle.

4. Operator: Lever operators with lock.
5. Stem Extension: For valves installed in insulated piping.
6. Memory Stop: For operator handles.

2.5 PLUG VALVES

- A. Plug Valves: MSS SP-78, 175-psi CWP, ASTM A 126 cast-iron body and bonnet, cast-iron plug, Buna N, Viton, or teflon packing, flanged or grooved end connections:
 1. Operator: Lever.
 2. Operator: Worm and gear with handwheel, sizes 6 inches and larger.
 3. Operator: Worm and gear with chain wheel, sizes 6 inches and larger, 96 inches or higher above floor.

2.6 GLOBE VALVES

- A. Globe Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or teflon disc, silicon bronze-alloy stem, teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.
- B. Globe Valves, 3 Inches and Larger: MSS SP-85, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted bonnet with bronze fittings, renewable bronze seat and disc, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with cast-iron follower, flanged end connections; and with cast-iron handwheel.

2.7 BUTTERFLY VALVES

- A. Butterfly Valves: MSS SP-67, 200-psi CWP, 150-psi maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals, wafer, lug, or grooved style:
 1. Disc Type: Nickel-plated ductile iron.
 2. Operator for Sizes 2 Inches to 6 Inches: Lever handle with latch lock.

2.8 CHECK VALVES

- A. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections:
- B. Swing Check Valves, 3 Inches and Larger: MSS SP-71, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.
- C. Wafer Check Valves: Class 125, 200-psi CWP, ASTM A 126 cast-iron body, bronze disc/plates, stainless-steel pins and springs, Buna N seals, installed between flanges.
- D. Lift Check Valves: Class 125, ASTM B 62 bronze body and cap (main components), horizontal or vertical pattern, lift-type, bronze disc or Buna N rubber disc with stainless-steel holder threaded or soldered end connections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

- A. Install valves as indicated, according to manufacturer's written instructions.
- B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.
- C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the center of the pipe.
- F. Install valves in a position to allow full stem movement.
- G. For chain-wheel operators, extend chains to 60 inches above finished floor elevation.
- H. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
 - 2. Wafer Check Valves: Horizontal or vertical position, between flanges.
 - 3. Lift Check Valve: With stem upright and plumb.

3.3 SOLDERED CONNECTIONS

- A. Cut tube square and to exact lengths.
- B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.
- C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.
- D. Open gate and globe valves to fully open position.
- E. Remove the cap and disc holder of swing check valves having composition discs.
- F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve.

Rotate tube or valve slightly to ensure even distribution of the flux.

- G. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.4 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.
- D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.5 FLANGED CONNECTIONS

- A. Align flange surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.
- C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.6 VALVE END SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2-1/2 Inches and Smaller: Solder ends, except provide threaded ends for heating hot water.
 - 2. Steel Pipe Sizes, 2-1/2 Inches and Smaller: Threaded or grooved end.
 - 3. Steel Pipe Sizes, 3 Inches and Larger: Grooved end or flanged.

3.7 APPLICATION SCHEDULE

- A. General Application: Use gate, ball, and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements.
- B. Domestic Water Systems: Use the following valve types:
 - 1. Gate Valves: Class 125, bronze or cast-iron body to suit piping system.
 - 2. Ball Valves: Class 150, 600-psi CWP, with stem extension.
 - 3. Plug Valves: Neoprene-faced plug, Buna N packing.
 - 4. Globe Valves: Class 125, bronze or cast-iron body to suit piping system, and bronze or teflon disc.
 - 5. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.
 - 6. Bronze Swing Check: Class 125, with rubber seat.
 - 7. Check Valves: Class 125, swing or wafer type as indicated.
- C. Chilled-Water Systems: Use the following valve types:

1. Gate Valves: Class 150, bronze body; or Class 125, cast-iron body.
2. Ball Valves: Class 150, 600-psi CWP, with stem extension and memory stop.
3. Plug Valves: Buna N packing.
4. Globe Valves: Class 125, bronze body with bronze or teflon disc; or Class 125, cast-iron body.
5. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM sleeve and stem seals.
6. Check Valves: Class 125, bronze body swing check with rubber seat; Class 125, cast-iron body swing check; Class 125, cast-iron body wafer check; or Class 125, cast-iron body lift check.

3.8 ADJUSTING

- A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION 15100

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.
- F. Licensed Engineer's hanger and support installation report specified in the "Field Quality Control" Article.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

- D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
 - 1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.
 - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Water: Potable.
 - 4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments

as required to properly support piping from building structure.

- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- I. Support fire protection systems piping independent of other piping.
- J. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- K. Load Distribution: Install hangers and supports so that piping live and dead loading 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 that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- M. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

<u>NPS (Inches)</u>	<u>LENGTH (Inches)</u>	<u>THICKNESS (Inches)</u>
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

- 4. Pipes 8 Inches and Larger: Include wood inserts.

5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15145

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. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For solvent drainage system. Include plans, elevations, sections, and details.

1.5 INFORMATIONAL SUBMITTALS

- A. Storm Shelter Only: Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF/ANSI 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-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

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 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 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. ANACO-Husky.
 - b. Dallas Specialty & Mfg. Co.
 - c. Fernco Inc.
 - d. Matco-Norca, Inc.
 - e. MIFAB, Inc.
 - f. Mission Rubber Company; a division of MCP Industries, Inc.
 - g. Stant.
 - h. Tyler Pipe.
 - 2. Standards: ASTM C 1277 and CISPI 310.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

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. ANACO-Husky.
 - b. Clamp-All Corp.
 - c. Dallas Specialty & Mfg. Co.
 - d. MIFAB, Inc.
 - e. Mission Rubber Company; a division of MCP Industries, Inc.
 - f. Stant.
 - g. Tyler Pipe.
2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings

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. MG Piping Products Company.
2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Ductile-Iron, Push-on-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Gaskets: AWWA C111/A21.11, rubber.

C. Ductile-Iron, Grooved-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51 with round-cut-grooved ends according to AWWA C606.
2. Ductile-Iron-Pipe Appurtenances:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Anvil International.
 - 2) Shurjoint Piping Products.
 - 3) Star Pipe Products.
 - 4) Victaulic Company.
 - b. Grooved-End, Ductile-Iron Fittings: ASTM A 536 ductile-iron castings with dimensions matching AWWA C110/A 21.10 ductile-iron pipe or AWWA C153/A 21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends.
 - c. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water; and bolts and nuts.

2.5 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
- D. Solvent Cement: ASTM D 2564.

2.6 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 3. Shielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Mission Rubber Company; a division of MCP Industries, Inc.
 - b. Standard: ASTM C 1460.

- c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.
- C. Form: Sheet or tub].
- D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 02300 "Earthwork."

3.2 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 coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. 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.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Storm Shelter Only: Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 15073 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- K. 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 two fixtures are installed back to back or side by side with common drain pipe. 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.
- L. 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.
- M. 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 and smaller; 1 percent downward in direction of flow for piping NPS 4 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.
- N. 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."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Install steel piping according to applicable plumbing code.
- P. Install aboveground PVC piping according to ASTM D 2665.
- Q. Install underground PVC piping according to ASTM D 2321.
- R. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- S. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
- T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors.
- V. Install sleeve seals for piping penetrations of concrete walls and slabs.
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. 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.
- E. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
- F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- G. Plastic, Nonpressure-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. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 15 Section "Valves"
- B. Shutoff Valves:
 - 1. Install gate or full-port ball valve for piping NPS 2 and smaller.
 - 2. Install gate valve for piping NPS 2-1/2 and larger.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Storm Shelter Only: Comply with requirements for seismic-restraint devices specified in Section 15073 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in "Hangers and Supports."
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. 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 : 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5 : 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - 3. NPS 2 : 10 feet with 3/8-inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 - 5. NPS 3: 12 feet with 1/2-inch rod.
 - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 - NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.

3. NPS 4 and NPS 5: 48 inches with 5/8-inch. rod.
 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- K. Install supports for vertical and PVC piping every 48 inches.
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. 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. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 48 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 or, in absence of published procedures, as follows:
 - 1. 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 separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - 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 required corrective action.

3.10 CLEANING AND PROTECTION

- 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.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 - 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 - 4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- E. Aboveground, vent piping NPS 5 and larger shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
1. Service class, cast-iron soil piping;
 2. Hubless, cast-iron soil pipe and fittings; [CISPI] [heavy-duty] [cast-iron] hubless-piping couplings; and coupled joints.
 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; coupled joints.
 3. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 15150

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 pipe, duct, and equipment insulation.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 15 Section "Supports and Anchors" for pipe insulation shields and protection saddles.
 - 2. Division 15 Section "Metal Ductwork" for duct lining.

1.3 DEFINITIONS

- A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperatures less than 75 deg F.
- D. Thermal resistivity is designated by an r-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.
- E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.
- F. Density: Is expressed in pcf.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or

inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.6 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping and duct systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Glass Fiber:
 - a. CertainTeed Corporation.
 - b. Knauf Fiberglass GmbH.
 - c. Manville.
 - d. Owens-Corning Fiberglas Corporation.
 - e. USG Interiors, Inc. - Thermafiber Division.
 2. Cellular Glass:
 - a. Pittsburgh Corning Corporation.
 3. Flexible Elastomeric Cellular:
 - a. Armstrong World Industries, Inc.
 - b. Halstead Industrial Products.
 - c. IMCOA.
 - d. Rubatex Corporation.
 4. Calcium Silicate:
 - a. Manville.
 - b. Owens-Corning Corporation.

2.2 GLASS FIBER

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
- C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
 2. Density: 12 pcf average maximum.
- D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
- E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
 2. Density: 10 pcf average maximum.
- F. Adhesive: Produced under the UL Classification and Follow-up service.
1. Type: Non-flammable, solvent-based.
 2. Service Temperature Range: Minus 20 to 180 deg F.
- G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 CELLULAR GLASS

- A. Material: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
- B. Facing: ASTM C 921, Type 1, factory-applied, laminated foil, flame-retardant, vinyl facing.
- C. Form: The following as indicated:
1. Blocks: ASTM C 552, Type I.
 2. Boards: ASTM C 552, Type IV.
 3. Preformed Pipe: ASTM C 552, Type II, Class 2 (jacketed).
 4. Special Shapes: ASTM C 552, Type III, in shapes and thicknesses as indicated.
- D. Thermal Conductivity: 0.38 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
- E. Minimum Density: 7 pcf.
- F. Maximum Density: 9.5 pcf.

2.4 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
1. Tubular Materials: ASTM C 534, Type I.
 2. Sheet Materials: ASTM C 534, Type II.
- B. Thermal Conductivity: 0.30 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F.

- C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.5 CALCIUM SILICATE

- A. Material: ASTM C 533, Type I; inorganic, hydrous calcium silicate, non-asbestos fibrous reinforcement; incombustible.
- B. Form: Molded flat block, curved block, grooved block, and preformed pipe sections as appropriate for surface.
- C. Thermal Conductivity: 0.60 Btu x inch/h x sq. ft. x deg F at 500 deg F.
- D. Dry Density: 15.0 pcf maximum.
- E. Compressive Strength: 60 psi minimum at 5 percent deformation.
- F. Fire Performance Characteristics: Provide materials identical to those whose fire performance characteristics have been determined, per test method indicated below, by UL or other testing and inspecting organization acceptable to authorities having jurisdiction.
 - 1. Test Method: ASTM E 84.
 - 2. Flame Spread: 0.
 - 3. Smoke Developed: 0.

2.6 INSULATING CEMENTS

- A. Mineral Fiber: ASTM C 195.
 - 1. Thermal Conductivity: 1.0 Btu x inch/h x sq. ft. x deg F average maximum at 500 deg F mean temperature.
 - 2. Compressive Strength: 10 psi at 5 percent deformation.
- B. Expanded or Exfoliated Vermiculite: ASTM C 196.
 - 1. Thermal Conductivity: 1.10 Btu x inch/h x sq. ft. x deg F average maximum at 500 deg F mean temperature.
 - 2. Compressive Strength: 5 psi at 5 percent deformation.
- C. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449.
 - 1. Thermal Conductivity: 1.2 Btu x inch/h x sq. ft. x deg F average maximum at 400 deg F mean temperature.
 - 2. Compressive Strength: 100 psi at 5 percent deformation.

2.7 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
 - 1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.8 JACKETS

- A. General: ASTM C 921, Type 1, except as otherwise indicated.
- B. Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
 1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.
 2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.
- C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20 mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.
 1. Adhesive: As recommended by insulation manufacturer.
- D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil thick, high-impact, ultra-violet-resistant PVC.
 1. Adhesive: As recommended by insulation manufacturer.
- E. Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper, roll stock ready for shop or field cutting and forming to indicated sizes.
 1. Finish and Thickness: Smooth finish, 0.010 inch thick.
 2. Moisture Barrier: 1 mil, heat-bonded polyethylene and kraft paper.
 3. Elbows: Preformed 45-degree and 90-degree, short- and long-radius elbows, same material, finish, and thickness as jacket.
- F. Stainless-Steel Jacket: ASTM A 167, Type 304 or 316, 0.10 inch thick, No. 2B finish, and roll stock ready for shop or field cutting and forming to indicated sizes.
 1. Moisture Barrier: 1 mil, heat-bonded polyethylene and kraft paper.
 2. Elbows: Gore type, for 45-degree and 90-degree elbows in same material, thickness, finish as jackets.
 3. Jacket Bands: Stainless steel, Type 304, 3/4 inch wide.

2.9 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd..
 1. Tape Width: 4 inches.
 2. Cloth Standard: MIL-C-20079H, Type I.
 3. Tape Standard: MIL-C-20079H, Type II.
- B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
 1. Stainless Steel: Type 304, 0.020 inch thick.
 2. Galvanized Steel: 0.005 inch thick.
 3. Aluminum: 0.007 inch thick.
 4. Brass: 0.01 inch thick.
 5. Nickel-Copper Alloy: 0.005 inch thick.

- C. Wire: 14 gage nickel copper alloy, 16 gage, soft-annealed stainless steel, or 16 gage, soft-annealed galvanized steel.
- D. Corner Angles: 28 gage, 1 inch by 1 inch aluminum, adhered to 2 inches by 2 inches kraft paper.
- E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.10 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.
 - 1. Water Vapor Permeance: 0.08 perm maximum.
 - 2. Temperature Range: Minus 20 to 180 deg F.
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
 - 1. Water Vapor Permeance: 0.02 perm maximum.
 - 2. Temperature Range: Minus 50 to 250 deg F.
 - 3. Color: Aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.
- B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.
 - 1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

- A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Install insulation with smooth, straight, and even surfaces.
- F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

- G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
- I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
- J. Keep insulation materials dry during application and finishing.
- K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
 - 1. Fibrous glass ducts.
 - 2. Metal ducts with duct liner.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 5. Flexible connectors for ducts and pipes.
 - 6. Vibration control devices.
 - 7. Testing laboratory labels and stamps.
 - 8. Nameplates and data plates.
 - 9. Access panels and doors in air distribution systems.
 - 10. Fire protection piping systems.
 - 11. Sanitary drainage and vent piping.
 - 12. Drainage piping located in crawl spaces, unless indicated otherwise.
 - 13. Below grade piping.
 - 14. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
 - 15. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.3 PIPE INSULATION INSTALLATION, GENERAL

- A. Tightly butt longitudinal seams and end joints. Bond with adhesive.
- B. Stagger joints on double layers of insulation.
- C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.
- D. Apply insulation with a minimum number of joints.
- E. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.
 - 3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
 - a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.

4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
 6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
- F. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.
- G. Exterior Wall Penetrations: For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor barrier coating.
- H. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer.
- I. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer.
- J. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.
- K. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
1. Use same material and thickness as adjacent pipe insulation.
 2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
 3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
 4. Insulate elbows and tees smaller than 3 inches pipe size with premolded insulation.
 5. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.
 6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
- L. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 15 Section "Supports and Anchors." For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends.
1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 BELOW GROUND PIPE INSULATION INSTALLATION

- A. General: The following are additional requirements for insulation applied to piping installed below ground.

- B. Coat bore surfaces of insulation materials with insulating cement of type recommended by insulation manufacturer. Apply enough cement to fill surface cells. Do not use adhesives for this coating.
- C. Secure insulation with a minimum of 2 stainless-steel bands for each section of insulation.
- D. Terminate insulation at anchor blocks.
- E. Apply insulation continuously through sleeves and manholes, except as specified above for exterior wall penetrations.
- F. Finishing: Apply 3 coats of asphaltic mastic to a finish thickness of 3/16 inch over insulation materials. Apply 10 by 10 mesh glass cloth between coats. Overlap edges of glass cloth by 2 inches.

3.5 GLASS FIBER PIPE INSULATION INSTALLATION

- A. Bond insulation to pipe with lagging adhesive.
- B. Seal exposed ends with lagging adhesive.
- C. Seal seams and joints with vapor barrier compound.

3.6 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
 - 1. Miter cut materials to cover soldered elbows and tees.
 - 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.7 EQUIPMENT INSULATION INSTALLATION, GENERAL

- A. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.
- B. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.
- C. Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.
- D. Bevel insulation edges for cylindrical surfaces for tight joint.
- E. Secure sections of insulation in place with wire or bands spaced at 9 inches centers, except for flexible elastomeric cellular insulation.

- F. Protect exposed corners with corner angles under wires and bands.
- G. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- H. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.
- I. Finishing: Except for flexible elastomeric cellular insulation, apply 2 coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.

3.8 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

- A. Secure insulation with anchor pins and speed washers.
- B. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.
- C. Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.9 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

- A. Install sheets of the largest manageable size.
- B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.
- C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.10 DUCT INSULATION

- A. Install block and board insulation as follows:
 - 1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
 - 2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.
- B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
 - 1. Smaller Than 24 Inches: Bonding adhesive applied in 6 inches wide transverse strips on 12 inches centers.
 - 2. 24 Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
 - 3. Overlap joints 3 inches.
 - 4. Seal joints, breaks, and punctures with vapor barrier compound.

3.11 JACKETS

- A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3 inch wide butt strips at end joints.
 - 1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
- B. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.
- C. Install metal jacket with 2 inches overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel draw bands 12 inches on center and at butt joints.
- D. Install the PVC jacket with 1 inch overlap at longitudinal and butt joints and seal with adhesive.
- E. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2 inch overlap at joints. Embed glass cloth between (2) 1/16 inch thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

3.12 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.13 APPLICATIONS

- A. General: Materials and thicknesses are specified in schedules at the end of this Section.
- B. Interior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic cold water.
 - 2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
 - 3. Domestic hot water.
 - 4. Recirculated hot water.
 - 5. Sanitary drains for fixtures accessible to the disabled.
 - 6. Refrigerant suction.
 - 7. Hydronic piping
- C. Interior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic cold water.
 - 2. Storm water. Insulate only roof drain bodies and horizontal rainwater leaders of storm water piping.
 - 3. Domestic hot water.
 - 4. Recirculated hot water.
 - 5. Refrigerant suction.
 - 6. Hydronic piping

7. Condensate piping
- D. Exterior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 1. Domestic cold water.
 2. Storm water.
 3. Refrigerant suction.
 4. Hydronic piping (35 to 99 deg F).
- E. Exterior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 1. Domestic cold water.
 2. Storm water.
 3. Refrigerant suction.
 4. Hydronic piping (35 to 99 deg F).
- F. Equipment: Unless otherwise indicated, insulate the following indoor equipment:
 1. Domestic cold water equipment, tanks, and pumps.
 2. Domestic hot water equipment, tanks, and water heaters.
 3. Low temperature brine equipment, tanks, pumps, and heat exchangers, 0 deg F to 34 deg F.
 4. Chilled water equipment, tanks, pumps, and heat exchangers.
 5. Heating water equipment, tanks, pumps, and heat exchangers, 100 deg F to 250 deg F.
- G. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
 1. Interior concealed supply, return and outside air ductwork.
 2. Interior exposed supply, return and outside air ductwork.
 3. Exterior exposed supply and return ductwork.
 4. Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.

3.14 PIPE INSULATION SCHEDULES

- A. General: Abbreviations used in the following schedules include:
 1. Field-Applied Jackets: P - PVC, K - Foil and Paper, A - Aluminum, SS - Stainless Steel.
 2. Pipe Sizes: NPS - Nominal Pipe Size.
- B. Domestic Cold Water, Condensate, and Storm Water All Sizes (Interior): 1/2 inch thick flexible elastomeric insulation. Field-applied jacket is not required.

INTERIOR DOMESTIC HOT WATER AND RECIRCULATED HOT WATER

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD- APPLIED JACKET
1/2 TO 1	FLEXIBLE ELASTOMERIC	1.0	NO	NONE
1-1/4 TO 6	FLEXIBLE ELASTOMERIC	1.5	NO	NONE

SANITARY DRAINS AND TRAPS EXPOSED AT FIXTURES FOR DISABLED - REFERENCE PLUMBING PLANS.

INTERIOR REFRIGERANT SUCTION AND DUAL-TEMP CHILLED/HOT WATER (35 TO 100 DEG F) EXPOSED AND CONCEALED

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	1	YES	NONE
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	1	YES	NONE

EXTERIOR REFRIGERANT SUCTION AND DUAL-TEMP HYDRONIC AND CHILLED/HOT WATER (35 TO 100 DEG F) EXPOSED AND CONCEALED

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	GLASS FIBER	2	YES	(A)
	FLEXIBLE ELASTOMERIC	1	YES	NONE
1-1/2 TO 8	GLASS FIBER	2-1/2	YES	(A)
	FLEXIBLE ELASTOMERIC	1	YES	NONE

3.15 EQUIPMENT INSULATION SCHEDULES

INTERIOR EXPOSED DOMESTIC COLD WATER EQUIPMENT, TANKS, AND PUMPS

<u>MATERIAL</u>	<u>FORM</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
FLEXIBLE ELASTOMERIC	SHEET	1	YES	NONE

3.16 DUCT SYSTEMS INSULATION SCHEDULE - REFERENCE HVAC PLANS, HVAC NOTES

END OF SECTION 15250

WATER DISTRIBUTION PIPING - SECTION 15411

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 water distribution piping from locations indicated to fixtures and equipment inside building.

1.3 DEFINITIONS

- A. Water Service Piping: Water piping outside building that conveys water to building.
- B. Service Entrance Piping: Water piping at entry into building between water service piping and water distribution piping.
- C. Water Distribution Piping: Water piping inside building that conveys water to fixtures and equipment throughout the building.
- D. The following are industry abbreviations for plastic piping materials:
 - 1. PVC: Polyvinyl chloride.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Combined Fire-Protection and Domestic, Service Entrance Piping: 250 psig.
 - 2. Service Entrance Piping: 160 psig.
 - 3. Water Distribution Piping: 125 psig.

1.5 SUBMITTALS

- A. Water Samples, Test Results, and Reports: Specified in "Field Quality Control" and "Cleaning" articles.

1.6 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping.
- D. Comply with NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.
- C. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
- D. Ductile-Iron Pipe: AWWA C151, 250-psig minimum pressure rating with mechanical- or push-on-joint bell, plain spigot end, and AWWA C104 cement-mortar lining. Include AWWA C111 ductile-iron gland, rubber gasket, and steel bolts with mechanical-joint pipe. Include AWWA C111 rubber gasket with push-on-joint pipe.
- E. Galvanized Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40.
- F. Galvanized, Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless, steel pipe.
- G. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80.

2.2 PIPE AND TUBE FITTINGS

- A. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.
- B. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- D. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.
- E. Ductile-Iron, Mechanical- or Push-on-Joint Fittings: AWWA C110, ductile- or gray-iron standard pattern; or AWWA C153, ductile-iron compact pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining. Include AWWA C111 ductile- or gray-iron glands, rubber gaskets, and steel bolts with mechanical-joint fittings. Include AWWA C111 rubber gaskets with push-on-joint fittings.
- F. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends conforming to AWWA C110 or AWWA C153. Include 2 gasketed ball-joint sections, 1 or more gasketed sleeve sections, 250-psig minimum working-pressure rating, and AWWA C550 epoxy interior coating. Assemble components for offset and expansion indicated. Include AWWA C111 ductile-iron glands, rubber gaskets, and steel bolts.

- G. Ductile-Iron Deflection Fittings: Compound coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends conforming to AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating and AWWA C104 cement-mortar lining or AWWA C550 epoxy interior coating. Include AWWA C111 ductile-iron glands, rubber gaskets, and steel bolts.
- H. Ductile-Iron Expansion Joints: 3-piece assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections conforming to AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating and AWWA C104 cement-mortar lining or AWWA C550 epoxy interior coating. Select and assemble components for expansion indicated. Include AWWA C111 ductile-iron glands, rubber gaskets, and steel bolts.
- I. Ductile-Iron Flanged Fittings: AWWA C110, ductile- or gray-iron standard pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining.
- J. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends with threads according to ASME B1.20.1. Furnish Class 300 unions if required to match piping.
- K. Cast-Iron, Threaded Flanges: ASME B16.1, Class 125. Furnish Class 250 flanges if required to match piping.
- L. Schedule 40, PVC Socket Fittings: ASTM D 2466.

2.3 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.
- C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
- D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.
- E. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.4 POLYETHYLENE ENCASEMENT

- A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105 polyethylene film, 0.008-inch minimum thickness, tube or sheet.

2.5 VALVES:

- A. Refer to Division 15 Section "Valves" for general-duty valves.
- B. Refer to Division 15 Section "Plumbing Specialties" for special-duty valves.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- D. Underground, Service Entrance Piping: Do not use flanges or valves underground. Use the following:
 - 1. 4- to 8-Inch NPS: Ductile-iron pipe and fittings, and mechanical or push-on joints.
- E. Aboveground, Water Distribution Piping: Use the following:
 - 1. 1-1/2-Inch NPS and Smaller: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
 - 2. 2-Inch NPS: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
 - 3. 2-1/2- to 3-1/2-Inch NPS: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
 - 4. 4- to 6-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.
 - 5. 8-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.
- F. Underground, Water Distribution Piping: Do not use flanges or valves underground. Use the following:
 - 1. 2-Inch NPS and Smaller: Soft copper tube, Type L; wrought-copper, solder-joint pressure fittings; and soldered joints.
 - 2. 2-1/2- to 4-Inch NPS: Hard copper tube, Type L; wrought-copper, solder-joint pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use gate, ball, or butterfly valves.
 - 2. Throttling Duty: Use globe, ball, or butterfly valves.
- B. Grooved-end butterfly valves may be used with grooved-end piping.

3.3 PIPING INSTALLATION, GENERAL

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

3.4 SERVICE ENTRANCE PIPING INSTALLATION

- A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building.
- B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each service entrance pipe.

- C. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.
- D. Ductile-Iron, Service Entrance Piping: Comply with AWWA C600. Install buried piping between shutoff valve and connection to water service piping with restrained joints. Anchor pipe to wall or floor at entrance. Include thrust-block supports at vertical and horizontal offsets.
 - 1. Encase piping with polyethylene film according to ASTM A 674 or AWWA C105.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- F. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

3.5 WATER DISTRIBUTION PIPING INSTALLATION

- A. Install piping level without pitch.
- B. Fitting Option for Hard Copper Tube: Mechanically formed tee-branch outlets may be used instead of tee fittings.

3.6 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube, drill pilot hole, form collar for outlet, dimple tube forming seating stop, and braze branch tube into collar.
- C. Grooved Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.7 ROUGHING-IN FOR WATER METERS

- A. Rough-in water piping and install water meters according to utility company's requirements. Water meters will be furnished by utility.

3.8 VALVE INSTALLATION

- A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.
- B. Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, and where indicated. Use ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.

- C. Drain Valves: Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
1. Install hose-end drain valves at low points in water mains, risers, and branches.
 2. Install stop-and-waste drain valves where indicated.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
 2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet and less.
 3. Adjustable roller hangers, MSS Type 43, for individual, straight, horizontal runs longer than 100 feet.
 4. Spring cushion rolls, MSS Type 49, if indicated, for individual, straight, horizontal runs longer than 100 feet.
 5. Pipe rolls, MSS Type 44, for multiple, straight, horizontal runs 100 feet or longer. Support pipe rolls on trapeze.
 6. Spring hangers, MSS Type 52, for supporting base of vertical runs.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
1. 3/4-Inch NPS and Smaller: Maximum horizontal spacing, 60 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 2. 1-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 3. 1-1/4-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 4. 1-1/2 and 2-Inch NPS: Maximum horizontal spacing, 96 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 5. 2-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 6. 3-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 7. 3-1/2-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 8. 4- and 5-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 9. 6-Inch NPS: Maximum horizontal spacing, 10 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 10. 8-Inch NPS: Maximum horizontal spacing, 10 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 10 feet.
- F. Install hangers for steel and ductile-iron piping with the following maximum spacing and minimum rod diameters:

1. 1-1/4-Inch NPS and Smaller: Maximum horizontal spacing, 84 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 2. 1-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 3. 2-Inch NPS: Maximum horizontal spacing, 10 feet with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 4. 2-1/2-Inch NPS: Maximum horizontal spacing, 11 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 5. 3- and 3-1/2-Inch NPS: Maximum horizontal spacing, 12 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 6. 4- and 5-Inch NPS: Maximum horizontal spacing, 12 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 7. 6-Inch NPS: Maximum horizontal spacing, 12 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 15 feet.
 8. 8- through 12-Inch NPS: Maximum horizontal spacing, 12 feet with 7/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

- A. Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- B. Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:
1. Booster Systems: Connect cold-water suction and discharge piping.
 2. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 3. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
 4. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

3.11 FIELD QUALITY CONTROL

- A. Inspect service entrance piping and water distribution piping as follows:
1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 2. 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.
 - 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 for final inspection by 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 test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test service entrance piping and water distribution piping as follows:

1. 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 separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.12 CLEANING

A. Clean and disinfect potable service entrance piping and water distribution piping as follows:

1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as 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 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 of chlorine. Isolate and allow to stand for 3 hours.
 - c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.13 COMMISSIONING

A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

B. Perform the following steps before putting into operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.

4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- D. Check plumbing specialties and verify proper settings, adjustments, and operation.
1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.
- E. Energize pumps and verify proper operation.

END OF SECTION 15411

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 plumbing specialties for water distribution systems; soil, waste, and vent systems; and storm drainage systems.
- B. Products installed but not furnished under this Section include water meters that will be furnished by the utility company to the site and ready for installation.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working pressure ratings, except where otherwise indicated:
 - 1. Water Distribution Systems, Below Ground: 150 psig.
 - 2. Water Distribution Systems, Above Ground: 125 psig.
 - 3. Soil, Waste, and Vent Systems: 10 foot head of water.
 - 4. Storm Drainage Systems: 10 foot head of water.
 - 5. Sanitary Sewage, Pumped Piping Systems: 75 psig.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
 - 1. Backflow preventers.
 - 2. Water pressure regulators.
 - 3. Strainers.
 - 4. Hose bibbs, wall hydrants, and post and sanitary hydrants.
 - 5. Drain valves.
 - 6. Water hammer arresters.
 - 7. Trap seal primer valves.
 - 8. Cleanouts, cover plates, and access panels.
 - 9. Floor drains, open receptors, trench drains, and roof drains.
 - 10. Sleeve penetration systems.
- C. Maintenance data for inclusion in Operating and Maintenance manuals as specified in Division 1 Section "Project Closeout" for the following:

1. Backflow preventers.
2. Water pressure regulators.
3. Backwater valves.
4. Grease interceptors, grease recovery units, oil interceptors and oil storage tanks, and solids interceptors.

1.5 QUALITY ASSURANCE

- A. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- B. Electrical Component Standard: NFPA 70, "National Electrical Code."
- C. Listing and Labeling: Provide equipment that is listed and labeled.
 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Design Concept: The Drawings indicate capacities, sizes, and dimensional requirements of system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality of products is on the Contractor. Refer to Division 1 Section "Product Substitutions."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Backflow Preventers:
 - a. Ames Co., Inc.
 - b. Cash by A.W. Cash Valve Mfg. Corp.
 - c. Cla-Val Co.
 - d. Conbraco Industries, Inc.
 - e. Febco.
 - f. Hersey Products, Inc., Grinnell Corp.
 - g. Sparco, Inc.
 - h. Watts Regulator Co.
 2. Water Pressure Regulators:
 - a. Bermad.
 - b. Cash by A.W. Cash Valve Mfg. Corp.
 - c. Cla-Val Co.
 - d. Conbraco Industries, Inc.
 - e. G A Industries, Inc.
 - f. Honeywell Braukmann.
 - g. Keckley by O.C. Keckley Co.
 - h. Spence Engineering Co., Inc.
 - i. Watts Regulator Co.

3. Wall Hydrants and Post Hydrants:
 - a. Ancon, Inc.
 - b. Jones Manufacturing Co., Inc.
 - c. Josam Co.
 - d. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
 - e. Wade Div., Tyler Pipe.
 - f. Watts Regulator Co.
 - g. Woodford Manufacturing Co. Div., WCM Industries, Inc.

4. Water Hammer Arresters:
 - a. Amtrol, Inc.
 - b. Ancon, Inc.
 - c. Jones Manufacturing Co., Inc.
 - d. Josam Co.
 - e. Precision Plumbing Products, Inc.
 - f. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
 - g. Sioux Chief Manufacturing Co., Inc.
 - h. Wade Div., Tyler Pipe.
 - i. Watts Regulator Co.

5. Trap Seal Primer Valves:
 - a. Ancon, Inc.
 - b. Jones Manufacturing Co., Inc.
 - c. Josam Co.
 - d. Wade Div., Tyler Pipe.
 - e. Watts Regulator Co.

6. Sleeve Penetration Systems:
 - a. Proset Systems, Inc.

2.2 BACKFLOW PREVENTERS

- A. General: ASSE Standard, backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.
 1. Working Pressure: 150 psig minimum except where indicated otherwise.
 2. 2 Inches and Smaller: Bronze body with threaded ends.
 3. 2-1/2 Inches and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
 - a. Interior Lining: FDA-approved epoxy coating, for backflow preventers having cast-iron or steel body.
 4. Interior Components: Corrosion-resistant materials.
 5. Exterior Finish: Polished chrome plate when used in chrome-plated piping system.
 6. Strainer on inlet, where strainer is indicated.

- B. Hose Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- C. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, consisting of (OS&Y) gate valves on inlet and outlet and strainer on inlet. Include test cocks and pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous pressure application.
 - 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
- D. Double-Check Backflow Prevention Assemblies: ASSE 1015, consisting of shutoff valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous pressure application.
 - 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

2.3 WATER PRESSURE REGULATORS

- A. General: ASSE 1003, water pressure regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y type strainer.
 - 1. 2 Inches and Smaller: Bronze body with threaded ends.
 - 2. Interior Components: Corrosion-resistant materials.
 - 3. Exterior Finish: Polished chrome plate when used in chrome plated piping system.

2.4 MISCELLANEOUS PIPING SPECIALTIES

- A. Piping specialties such as escutcheons, dielectric fittings, sleeves, and sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Strainers: Y pattern, except where otherwise indicated, full size of connecting piping. Include Type 304 stainless-steel screens with 3/64-inch perforations except where other screens are indicated.
 - 1. Pressure Rating: 125 psig minimum steam working pressure except where otherwise indicated.
 - 2. Sizes 2 Inches and Smaller: Bronze body, with female threaded ends.
 - 3. Sizes 2-1/2 Inches and Larger: Cast-iron body, with interior FDA-approved epoxy coating and flanged ends.
 - 4. Y-Type Strainers: Screwed screen retainer with centered blowdown.
 - a. Drain: Pipe plug.
- C. Hose Bibbs: Bronze body, with renewable composition disc, 1/2 or 3/4 inch threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.
 - 1. Finish: Rough brass.
 - 2. Operation: Operating key (handle). Provide 1 operating key.
- D. Wall Hydrants: ASME A112.21.3M or ASSE 1019, nonfreeze, automatic draining, antibackflow type, key operation, with 3/4 or 1 inch threaded or solder-joint inlet, and ASME B1.20.7 garden-hose threads on outlet. Provide 1 operating key.

1. Type: Recessed.
 2. Finish: Nickel bronze.
- E. Post Hydrants: ASME A112.21.3M, nonfreeze, bronze casing, cast-iron or cast-aluminum casing guard, key operation. Provide 1 operating key.
1. Inlet: 3/4 or 1 inch threaded.
 2. Outlet: Integral or field-installed, nonremovable and drainable hose-connection vacuum breaker, with outlet conforming to ASME B1.20.7 for garden-hose thread, and tapped drain port in valve housing.
 3. Length: As required for installing inlet valve below frost line.
- F. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes "A" through "F" and PDI WH-201 sizes "A" through "F."
- G. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. 125 psig minimum working pressure.
 2. Bronze body with atmospheric-vented drain chamber.
 3. Inlet and Outlet Connections: 1/2 inch threaded, union, or solder joint.
 4. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.5 CLEANOUTS

- A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.

2.6 FLOOR DRAINS

- A. General: Size outlets as indicated on Product Data Sheet or drawings.
- B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. See Product Data Sheet at end of Part 3 of this Section for shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features.
- C. Open Drains: 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 of length to provide depth indicated, and where indicated increaser fitting of size indicated, joined with ASTM C 564 neoprene gaskets. Size P trap as indicated on drawings.
- D. Deep Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.
1. 2 Inches Size: 4 inches minimum water seal.
 2. 2-1/2 Inches and Larger: 5 inches minimum water seal.
- E. Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

- F. Air Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.

2.7 SLEEVE PENETRATION SYSTEMS

- A. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
 - 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on 1 end for installation in cast-in-place concrete slabs.

PART 3 - EXECUTION

3.1 PIPING SPECIALTY INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated, at each water supply connection to mechanical equipment and systems, and to other equipment and systems as indicated. Comply with plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air-gap fitting on units having atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.
- B. Install strainers on supply side of each control valve, pressure-regulating valve, and solenoid valve, and where indicated.
- C. Install hose bibbs with integral or field-installed vacuum breaker.
- D. Install wall hydrants with integral or field-installed vacuum breaker.
- E. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.
- F. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4 inches size. Use 4 inches size for larger drainage piping except where larger size cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil or waste stack.
- G. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
- H. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- I. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.
- J. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer's written instructions.

3.2 FLOOR DRAIN INSTALLATION

- A. Install floor drains according to manufacturer's written instructions, in locations indicated.
- B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- C. Set drain elevation depressed below finished slab elevation as listed below to provide proper floor slope to drain:
 - 1. 60 inches Drain Area Radius: 1/2 inch depression.
 - 2. 10 Foot Drain Area Radius: 3/4 inch depression.
 - 3. 15 Foot Drain Area Radius: 1 inch depression.
 - 4. 20 Foot Drain Area Radius: 1-1/4 inches depression.
 - 5. 25 Foot Drain Area Radius: 1-1/2 inches depression.
- D. Trap drains connected to sanitary building drain.
- E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
- F. Position drains for easy accessibility and maintenance.

3.3 CONNECTIONS

- A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts to fixtures of sizes indicated, but not smaller than required by plumbing code.
- B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by plumbing code.
- C. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
- D. Interceptor Connections: Connect piping, flow control fittings, and accessories as indicated.

3.4 COMMISSIONING

- A. Preparation: Perform the following checks before start-up:
 - 1. Systems tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.
 - 3. There is clear space for servicing of specialties.
- B. Before operating systems, perform these steps:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open valves to full open position.
 - 3. Remove and clean strainers.
 - 4. Verify drainage and vent piping are clear of obstructions. Flush with water until clear.

3.5 ADJUSTING

- A. Adjust operation and correct deficiencies discovered during commissioning.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel on procedures related to startup and servicing of interceptors.

3.7 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 15430

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.
- B. Requirements of the following Division 15 Sections apply to this Section:
 - 1. "Basic Mechanical Requirements."
 - 2. "Basic Mechanical Materials and Methods."

1.2 SUMMARY

- A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.
- B. Products installed but not furnished under this Section include:
 - 1. Owner-supplied fixtures, as indicated.
 - 2. Accessories, appliances, appurtenances, and equipment specified in other sections, requiring plumbing services or fixture-related devices, as indicated.

1.3 DEFINITIONS

- A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.
- B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.
- C. Appliance: Device or machine designed and intended to perform a specific function.
- D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.
- E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.
- F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.
- G. Fixture: Installed receptor connected to the water distribution system, that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "Fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.
- H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.

- I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
 - 1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.
 - 2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
 - 3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
 - 4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.
- J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.
- C. Wiring diagrams for field-installed wiring of electrically operated units.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of ANSI Standard A117.1, "Buildings and Facilities -- Providing Accessibility and Useability for Physically Handicapped People," and Public Law 90-480, "Architectural Barriers Act, 1968," with respect to plumbing fixtures for the physically handicapped.
- B. Regulatory Requirements: Comply with requirements of ATBCB (Architectural and Transportation Barriers Compliance Board) "Uniform Federal Accessibility Standards (UFAS) - 1985-494-187" with respect to plumbing fixtures for the physically handicapped.
- C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
 - 1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixtures is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.
- B. Store plumbing fixtures on elevated platforms in a dry location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:
 - 1. Water Closets:
 - a. American Standard, Inc.
 - b. Crane Plumbing/Fiat Products.
 - c. Eljer; A Household International Co.
 - d. Kohler Co.
 - 2. Urinals:
 - a. American Standard, Inc.
 - b. Crane Plumbing/Fiat Products.
 - c. Eljer; A Household International Co.
 - d. Kohler Co.
 - 3. Lavatories:
 - a. Acorn Engineering Co.
 - b. American Standard, Inc.
 - c. Crane Plumbing/Fiat Products.
 - d. Eljer; A Household International Co.
 - e. Just Manufacturing Co.
 - f. Kohler Co.
 - 4. Sinks:
 - a. American Standard, Inc.
 - b. Crane Plumbing/Fiat Products.
 - c. Eljer; A Household International Co.
 - d. Elkay Manufacturing Co.
 - e. Just Manufacturing Co.
 - f. Kohler Co.
 - 5. Service Sinks:
 - a. Acorn Engineering Co.
 - b. American Standard, Inc.
 - c. Crane Plumbing/Fiat Products.
 - d. Eljer; A Household International Co.
 - e. Elkay Manufacturing Co.
 - f. Just Manufacturing Co.
 - g. Kohler Co.

6. Mop Basins:
 - a. Aqua Glass Corp.
 - b. Crane Plumbing/Fiat Products.
 - c. Florestone Products Co., Inc.
 - d. Stern-Williams Co., Inc.
 - e. Swan Corp.
 - f. Fiat
7. Showers:
 - a. Aqua Glass Corp.
 - b. Aquarius Div.; Briggs Industries, Inc.
 - c. Crane Plumbing/Fiat Products.
 - d. Eljer; A Household International Co.
 - e. Kohler Co.
8. Water Coolers:
 - a. Elkay Manufacturing Co.
 - b. Halsey Taylor; A Household International Co.
 - c. Haws Drinking Faucet Co.
 - d. Sunroc Corp.
 - e. Western Drinking Fountains; Sunroc Corp.
 - f. Oasis
9. Outlet Boxes:
 - a. Guy Gray Manufacturing Co., Inc.
 - b. Symmons Industries, Inc.
10. Toilet Seats:
 - a. Bemis Mfg. Co.
 - b. Beneke Div.; Sanderson Plumbing Products, Inc.
 - c. Church Seat Co.
 - d. Kohler Co.
11. Flushometers:
 - a. Zurn
 - b. American Standard, Inc.
 - c. Toto
12. Commercial/Industrial Cast-Brass Faucets:
 - a. Zurn
 - b. Delta
 - c. Kohler Co.
13. Commercial/Residential Cast-Brass and Cast-Brass Underbody Faucets:
 - a. Zurn
 - b. Delta Faucet Co.; Div. of Masco Corp.
 - c. Kohler Co.

14. Pressure Balance Bath/Shower Faucets:

- a. American Standard, Inc.
- b. Bradley Corp.
- c. Chicago Faucet Co.
- d. Delta Faucet Co.; Div. of Masco Corp.
- e. Eljer; A Household International Co.
- f. Elkay Manufacturing Co.
- g. Kohler Co.
- h. Lawler Manufacturing Co., Inc.
- i. Leonard Valve Co.
- j. Powers Process Controls; A Unit of Mark Controls Corp.
- k. Speakman Co.
- l. Symmons Industries, Inc.
- m. Valley Faucets Div.; U.S. Brass.

15. Shower Receptors:

- a. Aqua Glass Corp.
- b. Crane Plumbing/Fiat Products.
- c. Florestone Products Co., Inc.
- d. Stern-Williams Co., Inc.
- e. Swan Corp.

16. Miscellaneous Fittings (Except Faucets):

- a. Aquaflo Corp.
- b. Beaton & Corbin Mfg. Co.
- c. Brass Craft Subsidiary; Masco Co.
- d. Bridgeport Plumbing Products, Inc.
- e. Central Brass Manufacturing Co.
- f. Chicago Faucet Co.
- g. Connecticut Stamping & Bending Co.
- h. Crane Plumbing/Fiat Products.
- i. Eljer; A Household International Co.
- j. Kohler Co.
- k. McGuire Manufacturing Co., Inc.
- l. Royal Brass Mfg. Co.
- m. T & S Brass and Bronze Works, Inc.

17. Supports:

- a. Josam Co.
- b. Smith (Jay R.) Mfg. Co.
- c. Wade Div.; Tyler Pipe.

2.2 PLUMBING FIXTURES, GENERAL

- A. Provide plumbing fixtures and trim, fittings, other components, and supports as specified.

2.3 FAUCETS

- A. Faucets General: Unless otherwise specified, provide faucets that are cast brass with polished chrome-plated finish.

- B. Shower Faucet: ASME A112.18.1M, cast-brass combination single-lever, pressure-balancing mixing valve and escutcheon, and shower head, arm, and flange. Polished chrome-plated finish on all exposed metal.

2.4 FITTINGS, EXCEPT FAUCETS

- A. Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.
- B. Lavatory Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 3/8 inch by 12 inches flexible tubing riser outlet.
- C. Lavatory Traps: Cast-brass, 1-1/4 inches NPS adjustable P-trap with cleanout, 0.045-inch wall thickness, tubular waste to wall, and wall flange.
- D. Sink Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 1/2 inch by 12 inches flexible tubing riser outlet.
- E. Water Closet Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 1/2 inch by 12 inches flexible tubing riser outlet with collar.
- F. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.
- G. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.

2.5 FLUSHOMETERS

- A. Provide flushometers compatible with fixtures, with features and of consumption indicated.
- B. Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified. Type shall be diaphragm operation except where other type is specified.
- C. Finish: Exposed metal parts shall be polished chrome-plated, except components installed in a concealed location may be rough brass or unfinished.
- D. Water Closet Flushometers: Furnish with following features.
 - 1. Non-hold-open feature.
 - 2. Furnish flushometers with factory-set or field-adjusted maximum water consumption per cycle:
 - a. Consumption: 1.6 gallons per flushing cycle.
- E. Urinal Flushometers: Furnish with following features.
 - 1. Non-hold-open feature.
 - 2. Furnish flushometers with factory-set or field-adjusted maximum water consumption per cycle:
 - a. Consumption: 1.0 gallons per flushing cycle.

2.6 TOILET SEATS

- A. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.
- B. Toilet Seats: Extra heavy-duty, commercial/industrial type, elongated, open front, solid plastic, with check hinge.

2.7 PLUMBING FIXTURE SUPPORTS

- A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.
- B. Support categories are:
 - 1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction.
 - 2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.
 - 3. Reinforcement: 1/4 inch by 6 inches steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.
- C. Support Types: Provide support of category specified, of type having features required to match fixture.
- D. Provide supports specified as part of fixture description, in lieu of category and type requirements above.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.
- B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
 - 1. Carriers for following fixtures:
 - a. Wall-hanging fixtures supported from wall construction.
 - 2. Chair carriers for the following fixtures:

- a. Wall-hanging urinals.
- b. Wall-hanging lavatories and sinks.
- c. Wall-hanging drinking fountains and electric water coolers.

3. Reinforcement for the following fixtures:

- a. Floor-mounted lavatories required to be secured to wall.
- b. Floor-mounted sinks required to be secured to wall.
- c. Recessed, box-mounted electric water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

- A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.
- B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.
- C. Install wall-hanging, back-outlet urinals with gasket seals.
- D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
- E. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
- F. Fasten wall-mounted fittings to reinforcement built into walls.
- G. Fasten counter-mounting-type plumbing fixtures to casework.
- H. Secure supplies behind wall or within wall pipe space, providing rigid installation.
- I. Set shower receptors and mop basins in leveling bed of cement grout.
- J. Install stop valve in an accessible location in each water supply to each fixture.
- K. Install trap on fixture outlet except for fixtures having integral trap.
- L. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
- M. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other sections of Division 15. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 15.

2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.
- C. Replace washers of leaking and dripping faucets and stops.
- D. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
- E. Review the data in Operating and Maintenance Manuals.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

END OF SECTION 15440

NATURAL GAS PIPING SYSTEMS - SECTION 15488

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes piping, specialties, and accessories for natural gas systems within building and to gas meters.
- B. This Section includes piping, specialties, and accessories for natural gas systems within building and to point indicated.

1.3 DEFINITIONS

- A. Low-Pressure Natural Gas Piping: Operating pressure of 0.5 psig or less.
- B. Medium-Pressure Natural Gas Piping: Operating pressure greater than 0.5 psig, but not greater than 2 psig.
- C. High-Pressure Natural Gas Piping: Operating pressure greater than 2 psig, but not greater than 5 psig.
- D. Gas Service: Operating pressure indicated.
- E. Gas Service: Pipe from gas main or other source to gas point of delivery for building being served. Piping includes gas service piping, gas valve, service pressure regulator, meter bar or meter support, and gas meter.
- F. Gas Delivery Point: Gas meter or service pressure regulator outlet, or gas service valve if gas meter is not provided.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings: Except where otherwise indicated, minimum pressure requirements are as follows:
 - 1. Low-Pressure Natural Gas Piping: 2 psig.
 - 2. Medium-Pressure Natural Gas Piping: 10 psig.
 - 3. High-Pressure Natural Gas Piping: 20 psig.
 - 4. Natural Gas Service Piping: 100 psig.
- B. Approximate values of natural gas supplied for these systems are as follows:
 - 1. Heating Value: 1000 Btu/cu. ft..
 - 2. Specific Gravity: 0.6.
 - 3. Service Line Pressure: 15 to 20 psig.

1.5 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 natural gas specialty and special-duty valve. Include pressure rating, rated capacity, and settings of selected models.
- C. Coordination Drawings for natural gas piping, including required clearances and relationship to other services for same work areas.
- D. Test reports specified in "Field Quality Control" Article in Part 3.
- E. Maintenance data for natural gas specialties and special-duty valves to include in the operation and maintenance manual specified in Division 1 Section "Contract Closeout."

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 54, "National Fuel Gas Code," for gas piping materials and components; installations; and inspecting, testing, and purging.
- B. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated control devices.
- C. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.
- D. Listing and Labeling: Provide equipment and accessories specified in this Section that are listed and labeled.
 - 1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- E. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of natural gas piping equipment, specialties, and accessories and are based on specific types and models indicated. Other manufacturers' equipment and components with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.8 SEQUENCING AND SCHEDULING

- A. Notification of Interruption of Service: Notify each affected user when gas supply will be turned off.
- B. Work Interruptions: Leave gas piping systems in safe condition when interruptions in work occur during repairs or alterations to existing gas piping systems.

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:
 - 1. Gas Stops, 2-Inch NPS and Smaller:
 - a. Hammond Valve Corp.
 - b. Jomar International, Ltd.
 - c. Maxitrol Co.
 - d. McDonald: A.Y. McDonald Mfg. Co.
 - e. Milwaukee Valve Co., Inc.
 - f. Mueller Co.
 - g. National Meter.
 - 2. Gas Valves, 2-Inch NPS and Smaller:
 - a. Conbraco Industries, Inc.; Apollo Div.
 - b. Core Industries, Inc.; Mueller Steam Specialty Div.
 - c. Huber: J.M. Huber Corp.; Flow Control Div.
 - d. McDonald: A.Y. McDonald Mfg. Co.
 - e. Milliken Valve Co., Inc.
 - f. Milwaukee Valve Co., Inc.
 - g. Mueller Co.
 - h. National Meter.
 - i. Nordstrom Valves, Inc.
 - j. Olson Technologies, Inc.
 - 3. Gas Valves, 2-1/2-Inch NPS and Larger:
 - a. Core Industries, Inc.; Mueller Steam Specialty Div.
 - b. Huber: J.M. Huber Corp.; Flow Control Div.
 - c. Milliken Valve Co., Inc.
 - d. Nordstrom Valves, Inc.
 - e. Olson Technologies, Inc.
 - f. Xomox Corp.
 - 4. Earthquake-Actuated, Automatic, Gas Shutoff Valves:
 - a. Mark Products, Inc.
 - b. Pacific Seismic Products, Inc.
 - c. Quake Defense, Inc.; Emergency Fail-Safe Div.
 - d. Quakemaster Seismic Safety Systems.
 - e. SafeTQuake Corp.
 - f. Seismic Safety Products, Inc.
 - 5. Solenoid Valves:
 - a. Atkomatic Valve Co., Inc.
 - b. Automatic Switch Co.
 - c. Goyen Valve Corp.

- d. Honeywell, Inc.; Skinner Valve Div.
- e. ITT Fluid Technology Corp.; ITT Controls.
- f. Magnatrol Valve Corp.

6. Gas Pressure Regulators:

- a. American Meter Co.
- b. Equimeter, Inc.
- c. Fisher Controls International, Inc.
- d. Maxitrol Co.
- e. National Meter.
- f. Richards Industries, Inc.; Jordan Valve Div.
- g. Schlumberger Industries; Gas Div.

2.2 PIPES AND TUBES

- A. Steel Pipe: ASTM A 53; Type E, electric-resistance welded or Type S, seamless; Grade B; Schedule 40; black.
- B. Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
- C. Stainless-Steel Tube: AGA LC 1 and AGA LC 1a, corrugated. Include steel striker plates.

2.3 PIPE AND TUBE FITTINGS

- A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends conforming to ASME B1.20.1.
- B. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends conforming to ASME B1.20.1.
- C. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250.
- D. Steel Fittings: ASME B16.9, wrought steel, butt-welding type; and ASME B16.11, forged steel.
- E. Steel Flanges and Flanged Fittings: ASME B16.5.
- F. Copper Fittings: ASME B16.22, wrought copper, streamlined pattern.
- G. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
- H. Stainless-Steel Tube Fittings: AGA LC 1 and AGA LC 1a, brass with threaded ends conforming to ASME B1.20.1 or mechanical couplings, made by or for manufacturer of corrugated stainless-steel tubing.
- I. Stainless-Steel Tube Manifolds: Suitable for use with corrugated stainless-steel tubing.
- J. Transition Fittings: Type, material, and end connections to match piping being joined.

2.4 JOINING MATERIALS

- A. Common Joining Materials: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joining materials not included in this Section.

- B. Brazing Filler Metals: AWS A5.8, Silver Classification BAg-1. Filler metal containing phosphorus is prohibited.
- C. Joint Compound and Tape: Suitable for natural gas.
- D. Gasket Material: Thickness, material, and type suitable for natural gas.

2.5 VALVES

- A. Manual Valves: Conform to standards listed or, where appropriate, to ANSI Z21.15.
- B. Gas Stops, 2-Inch NPS and Smaller: AGA-certified, bronze-body, plug type with bronze plug, ball type with chrome-plated brass ball, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal, for 2 psig or less natural gas. Include AGA stamp, flat or square head or lever handle, and threaded ends conforming to ASME B1.20.1.
 - 1. Locking Device: Include locking (tamperproof) feature.
- C. Gas Valves, 2-Inch NPS and Smaller: ASME B16.33, 150 psig WOG, bronze body, bronze plug, straightaway pattern, square head, tapered-plug type, with threaded ends conforming to ASME B1.20.1.
- D. Gas Valves, 2-1/2-Inch NPS and Larger: MSS SP-78, Class 125 or Class 175 WOG, lubricated-plug type, semisteel body, wrench operated, with flanged ends.

2.6 PIPING SPECIALTIES

- A. Gas Pressure Regulators: ANSI Z21.18, single-stage, steel-jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends conforming to ASME B1.20.1 for 2-inch NPS and smaller and flanged ends for 2-1/2-inch NPS and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in cubic feet per hour of natural gas at specific gravity are as indicated.
 - 1. Service Pressure Regulators: Inlet pressure rating not less than natural gas distribution system service pressure.
 - 2. Line Gas Pressure Regulators: Inlet pressure rating not less than system pressure.
 - 3. Appliance Gas Pressure Regulators: Inlet pressure rating not less than system pressure, with capacity and pressure setting matching appliance.
 - 4. Gas Pressure Regulator Vents: Factory- or field-installed corrosion-resistant screen in opening when not connected to vent piping.
- B. Flexible Connectors: ANSI Z21.24, copper alloy.
- C. Strainers: Y pattern, full size of connecting piping. Include stainless-steel screens with 3/64-inch perforations, except where other screens are indicated.
 - 1. Pressure Rating: 125-psig minimum steam or 175-psig WOG working pressure, except where otherwise indicated.
 - 2. 2-Inch NPS and Smaller: Bronze body, with threaded ends conforming to ASME B1.20.1.
 - 3. 2-1/2-Inch NPS and Larger: Cast-iron body, with flanged ends.
 - 4. Screwed screen retainer with centered blow-down and pipe plug.

2.7 PROTECTIVE COATING

- A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere. Coating properties include the following:
 - 1. Applied to pipe and fittings treated with compatible primer before applying tape.
 - 2. Overall Thickness: 20 mils, synthetic adhesive.
 - 3. Water-Vapor Transmission Rate: Maximum 0.10 gal./100 sq. in..
 - 4. Water Absorption: 0.02 percent maximum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Close equipment shutoff valves before turning off gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.
- B. Comply with NFPA 54 Paragraph "Prevention of Accidental Ignition."

3.2 SERVICE ENTRANCE PIPING

- A. Extend natural gas piping and connect to gas distribution system (gas service) piping in location and size indicated for gas service entrance to building.
 - 1. Gas distribution system piping and service pressure regulator shall be provided by Contractor.
- B. Install shutoff valve, downstream from gas meter, outside building at gas service entrance.

3.3 PIPING APPLICATIONS

- A. General: Flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating may be used in applications below, except where otherwise indicated.
- B. Low-Pressure, 0.5 psig or Less, Natural Gas Systems: Use the following:
 - 1. 1-Inch NPS and Smaller: Steel pipe, malleable-iron threaded fittings, and threaded joints.
 - 2. 1-1/4- to 2-Inch NPS: Steel pipe, malleable-iron threaded fittings, and threaded joints.
 - 3. 2-1/2- to 4-Inch NPS: Steel pipe, malleable-iron threaded fittings, and threaded joints.
 - 4. 4-Inch NPS and Larger: Steel pipe, butt-welding fittings, and welded joints.
- C. Medium-Pressure, 0.5 to 2 psig, Natural Gas Systems: Use the following:
 - 1. 1-Inch NPS and Smaller: Steel pipe, butt-welding fittings, and welded joints.
 - 2. 1-1/4-Inch NPS and Larger: Steel pipe, butt-welding fittings, and welded joints.
- D. High-Pressure, above 2 to 5 psig, Natural Gas Systems: Steel pipe, butt-welding fittings, and welded joints.
- E. Gas Service, above 5 psig, Natural Gas Piping at Gas Meters and Regulators: Steel pipe, butt-welding fittings, and welded joints.

3.4 VALVE APPLICATIONS

- A. Use gas stops for shutoff to appliances with 2-inch NPS or smaller low-pressure gas supply.
- B. Use gas valves for shutoff to appliances with 2-1/2-inch NPS or larger low-pressure gas supply and all sizes for medium-pressure gas supply.
- C. Use gas valves of sizes indicated for gas service piping, meters, mains, and where indicated.

3.5 PIPING INSTALLATIONS

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.
- B. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of gas meters. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- C. Install gas piping at uniform grade of 0.1 percent slope upward toward risers.
- D. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- E. Connect branch piping from top or side of horizontal piping.
- F. Install unions in pipes 2-inch NPS and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- G. Install corrugated stainless-steel tube and fittings according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.
- H. Install strainers on supply side of each control valve, gas pressure regulator, solenoid valve, and elsewhere as indicated.
- I. Install dielectric fittings (unions and flanges) with ferrous and brass or bronze end connections, separated by insulating material, where piping of dissimilar metals is joined.
- J. Install dielectric fittings (unions and flanges) with 2 ferrous end connections, separated by insulating material, at outlet from gas meter and, where indicated, for ferrous piping.
- K. Install flanges on valves, specialties, and equipment having 2-1/2-inch NPS and larger connections.
- L. Anchor piping to ensure proper direction of piping expansion and contraction. Install expansion joints, expansion loops, and pipe guides as indicated.
- M. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

3.6 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Use materials suitable for natural gas service.
 - 1. Brazed Joints: Make joints with brazing alloy having melting point greater than 1000 deg F. Brazing alloys containing phosphorus are prohibited.

3.7 VALVE INSTALLATION

- A. Install valves in accessible locations, protected from damage. Tag valves with metal tag indicating piping supplied. Attach tag to valve with metal chain.
 - 1. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for valve tags.
- B. Install gas valve upstream from each gas pressure regulator. Where 2 gas pressure regulators are installed in series, valve is not required at second regulator.
- C. Install pressure relief or pressure-limiting devices so they can be readily operated to determine if valve is free; test to determine pressure at which they will operate; and examine for leakage when in closed position.

3.8 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices.
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. 1/2-Inch NPS: Maximum span, 72 inches; minimum rod size, 3/8 inch.
 - 2. 3/4- and 1-Inch NPS: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 3. 1-1/4-Inch NPS: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. 1-1/2- and 2-Inch NPS: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 5. 2-1/2- to 3-1/2-Inch NPS: Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 6. 4-Inch NPS and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.
- C. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. 3/8-Inch NPS: Maximum span, 48 inches; minimum rod size, 3/8 inch.
 - 2. 1/2- and 5/8-Inch NPS: Maximum span, 72 inches; minimum rod size, 3/8 inch.
 - 3. 3/4- and 7/8-Inch NPS: Maximum span, 84 inches; minimum rod size, 3/8 inch.
 - 4. 1-Inch NPS: Maximum span, 96 inches; minimum rod size, 3/8 inch.
- D. Support horizontal, corrugated stainless-steel tubing according to manufacturer's written instructions.
- E. Support vertical pipe and tube at each floor.

3.9 CONNECTIONS

- A. Install gas piping next to equipment and appliances using gas to allow service and maintenance.
- B. Connect gas piping to equipment and appliances using gas with shutoff valves and unions. Install gas valve upstream from and within 72 inches of each appliance using gas. Install union or flanged connection downstream from valve. Include flexible connectors when indicated.
- C. Sediment Traps: Install tee fitting with capped nipple in bottom forming drip, as close as practical to inlet for appliance using gas.
- D. Electrical Connections: Wiring is specified in Division 16 Sections.

3.10 ELECTRICAL BONDING AND GROUNDING

- A. Install aboveground portions of natural gas piping systems that are upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.
- B. Do not use gas piping as grounding electrode.

3.11 FIELD QUALITY CONTROL

- A. Inspect, test, and purge piping according to NFPA 54, Part 4 "Gas Piping Inspection, Testing, and Purging" and requirements of authorities having jurisdiction.
- B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
- C. Report test results promptly and in writing to Architect and authorities having jurisdiction.
- D. Verify capacities and pressure ratings of gas meters, regulators, valves, and specialties.
- E. Verify correct pressure settings for pressure regulators.
- F. Verify that specified piping tests are complete.

3.12 ADJUSTING

- A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 15488

**ADDITIONS AND RENOVATIONS TO CAFETERIA AT
SALTER ELEMENTARY SCHOOL
(#22-10)**

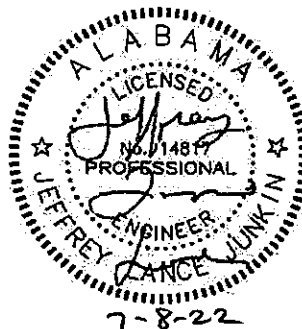
PROJECT NO. 2285

JULY 2022

**STEWART ENGINEERING, INC.
ELECTRICAL CONSULTANTS**

PHONE (256) 237-0891

ANNISTON, ALABAMA 36202



ELECTRICAL - SECTION 16000

1.0 - GENERAL

1.1 Related Documents

The general provisions of the contract, including General Conditions and General Requirements, apply to the work specified in this section.

1.2 Description of Work

Furnish all labor and materials required to complete the electrical work indicated on drawings or herein specified. Major work included in this section shall be:

- A. Arrange with local utility companies for providing such electrical and electronic services as indicated or herein specified. Pay to utility companies any charges associated with providing these services.
- B. 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 completed project or any code pertaining thereto.
- C. Furnish and install complete electrical light and power system.
- D. Connect all meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches and/or other equipment forming part of the system.
- E. Connect all electrical equipment mentioned in this section or noted on drawings, whether furnished by Electrical Contractor or by others.
- F. Procure and pay for permits and certificates as required by Local and State Ordinances and Fire Underwriters Certificate of Inspection.
- G. Complete alterations and additions to existing Fire Alarm System.
- H. Complete alterations and additions to existing Sound System.
- J. Furnish and install outlet boxes, faceplates, conduit raceways, cable, data outlet faceplates and jacks, patch panels, and termination connectors and all other equipment needed for complete Telephone and Computer Cabling System.
- K. Visit the Site and determine conditions which affect this contract. Failure to do so will in no way relieve contractor of his responsibility under this contract.
- L. Submit to Architect a Certificate of Final Inspection from local Inspection Department along with assurance of completion of any items on this list.

1.3 Qualifications of Electrical Subcontractor

The Electrical Subcontractor shall meet the following qualifications:

- A. In business as an Electrical Contractor for two (2) years prior to the date of opening bids. Employees of a General Contractor will not be acceptable for work for this Section.
- B. Have completed at least five (5) projects with Electrical installations of character and scope comparable with this project. Contractor must supply list of projects, with the project shop drawings, for approval. If Contractor uses subcontractor for any portion of project, the name of this subcontractor must be submitted, along with similar project list, for approval.
- C. If Electrical Subcontractor proposes to use any other Subcontractor for any part of the work, these Subcontractors shall also meet the above qualifications before bid is acceptable.
- D. If Subcontractor's office is located more than 75 miles from jobsite, he shall submit the name of a service company with a 20-mile radius of the jobsite, for approval, who will be responsible through him for service required during the warranty period.

1.4 Drawings

- A. Drawings indicate diagrammatically extent, general character and approximate location of work. Where work is indicated but with minor details omitted, furnish and install it complete so as to perform its intended function. For Building Details and Mechanical Equipment follow Architectural, Structural and Mechanical Drawings and fit electrical work thereto.
- B. Take finish dimensions at Job in preference to scale dimension.
- C. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Architect.

1.5 Manufacturers Drawings and Data

- A. Within twenty (20) days after award of contract submit six (6) copies of Manufacturer's drawings to Architect for review of the following items. Partial submittals will be acceptable. Shop drawings of a specified item or system to be in one submittal:
 - 1. Lighting Fixtures
 - 2. Panelboards
 - 3. Sound System
 - 4. Disconnect Switches
 - 5. Fire Alarm System
 - 6. Computer Cabling System
 - 7. Lighting Control Panels
 - 8. Cafeteria Sound System
 - 9. List of five (5) projects that Contractor (and any sub-contractor) has completed similar in size and capacity to this project
- B. Drawings of power equipment to contain exact details of device placement, phasing and numbering in elevation form. They shall also contain elevation view of front panelboard/switchboard outside cover.

C. See Section 01350 – Administrative Requirements, for submittal procedures.

1.6 Progress of Work

- A. Cooperate with other crafts and schedule work as needed. Do not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.
- B. Be informed as to equipment furnished by other trades but not liable for added cost incurred by equipment substitutions made by others above wiring indicated on drawings.

1.7 Insurance

- A. This Contractor to carry Workman's Compensation Insurance and Public Liability Insurance and save Owner free from damage from suits arising out of the performance of this contract.

1.8 Protection of Persons and Property During Construction

- A. Take all precautions to provide safety and protection to persons and protection of materials and property as necessary, including protection from injury from rotating or moving equipment, tools, hot surfaces, holes, shafts, falling objects, electrical energy and all other potential hazards. Erect signs, barricades, warning lights, instruct workmen and others who may be subject to construction hazards.
- 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.

1.9 Service Entrance

- A. Main service shall be as shown on drawings. Verify with the local utility company that the location, arrangement, voltage, phase and connections to utility service as well as required metering equipment are coordinated with and in accordance with requirements of the local utility company. If their requirements are at variance with these drawings or specifications, the contract price shall include any additional cost necessary to meet those requirements without extra cost to the Owner after contract is entered into. Notify Architect of any changes required before proceeding with work.

1.10 Cleaning Up

- A. During the progress of the work keep the Owner's premises in a neat and orderly condition, free from accumulation of debris resulting from this work and at completion of the work, remove all material, scrap, etc., not a part of this contract.

1.11 Operating and Maintenance Instructions

- A. Turn over to Architect one set of marked "as built" drawings, one set of all equipment catalogs and maintenance data and one set of shop drawings on all equipment requiring same. Explain and demonstrate electrical systems to Owner's representative.

1.12 Guarantee

- A. Guarantee that all work executed under this section will be free from defects of workmanship and materials for a period of one year from date of final acceptance of this work. Promptly repair, replace or otherwise make good, any defect becoming apparent during this period, upon notification and at no charge to Owner.
- B. See Section 01910 – Closeout Submittals, for additional warranty requirements.

1.13 Temporary Systems

- A. The Electrical Contractor shall be responsible for the furnishing and installation of all equipment and materials necessary for providing temporary power required by all trades during construction. All temporary wiring shall be installed so as not to interfere with the new construction and shall be made in a safe and approved manner.
- B. It shall be the responsibility of the Electrical Contractor to visit the site prior to submitting bid and thoroughly review all existing conditions affecting the temporary system requirements.

2.0 PRODUCTS

2.1 Standard of Materials

- A. All materials shall be new and listed by the Underwriters' Laboratories as conforming to these standards.
- B. 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. All proposed substitutions shall be approved in writing at least five days prior to bid date.
- C. It shall be understood that the Architect has the authority and may reject any material or equipment not specified or approved, or showing defects of manufacturer or workmanship, before or after installation.

2.2 Conduits

- A. Rigid: To be mild steel piping, galvanized inside and outside, and conform to ASA Specification C80.180.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburg.
- B. Intermediate Metal Conduit: Shall be hot dipped galvanized inside and outside, and manufactured in accordance with U.L. Standard #6 or #1242. By Allied or approved equal.
- C. E.M.T.: To be of high-grade steel electro-galvanized outside and lacquer or enamel coating inside and conform to ASA Specification C80.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburg.
- D. PVC: To be of high impact PVC Schedule 40 and conform to Underwriters' Laboratories Standard UL-651. PVC to be used only where indicated on drawings. By Pittsburg, R. G. Sloane or Carlon.

2.3 Couplings and Connectors

- A. Rigid & IMC: By Raco, Efcor, Republic or Appleton.
- B. E.M.T.: All steel raintight type. Pressure indented type or cast metal will not be approved. All connectors to be insulated. By Appleton, Raco or Efcor.
- C. PVC: To be of high impact PVC Schedule 40. Joints to be made with PVC solvent cement as recommended by manufacturer. By Pittsburg, R.G. Sloane or Carlon.

2.4 Bushings

- A. All rigid bushings 1 1/4" and larger shall be the insulated grounding type. All other bushings shall be OZ. Mfg. Co., Type B or Efcor Type 55 insulated metallic type or by Sylvania.

2.5 Conduit Seals

- A. All conduit seals for wall, floor or ceiling penetrations shall be by 3M Company or approved equal.

2.6 Conduit Accessories

- A. Conduit clamps and supports by Efcor, Steel City or G. A. Tinnerman. Conduit fittings by Pyle-National, Crouse-Hinds and Appleton.

2.7 Building Wire

- A. Conductors shall have current carrying capacities as per N.E.C. and with 600-volt insulation THW #12 minimum. Conductors #3 and smaller to be copper. Conductors #2 and larger to be copper unless specifically indicated aluminum on drawings. Insulation for conductors to be N.E.C. Type THW for #3 and smaller. Insulation for conductors #2 and larger shown in cable specifications. By Phelps-Dodge, Rome, Simplex, General Cable, Okonite or Anaconda.

2.8 Cable

- A. Conductors for 0-600 volts shall have copper, current carrying capacities as per N.E.C. with cross-linked polyethylene insulation and thickness to IPCEA standards, and U.L. Standard #44. Rated for wet and dry locations. Type THW or THWN. By Phelps-Dodge, Rome, Simplex, General Cable, Okonite or Anaconda.

2.9 Fixture Wire

- A. Conductors for fixtures of 300 watts or less shall be #16 type TFN, for fixtures of more than 300 watts #14 type TFN shall be used. Conductors in channel of fluorescent fixtures shall be type THHN or RHH. Conductors shall be either Phelps-Dodge, Anaconda, Rome or General Cable.

2.10 Control and Signal System Wire

- A. Type TFF minimum size #16 copper and fully color coded. Conductors by Phelps-Dodge, Anaconda, Rome or General Cable.

2.11 Junction Boxes (thru 4-11/16")

- A. Sheet Metal: To be standard type with knockouts made of hot dipped galvanized steel by Steel City, Racor, Appleton or approved equal.
- B. Cast: To be type FS, FD, JB, GS or SEH as required for application.
- C. Junction and Pull Boxes (larger than 4-11/16"): To be cast aluminum for all below grade exterior use and where shown all other shall be oil tight, JIC boxes not less than 16 gauge. Hoffman type "CH" Boxes.

2.12 Gutters

- A. Up to and including 8" x 8" shall be a standard manufacturer's item as manufactured by Square D, ITE or B & C Company. Special gutters shall be made of code grade galvanized sheet steel with hinged covers having approved fastening devices. At each location shown for gutters, install a wood backboard not less than 3/4" thick, paint 2 coats of gray enamel, mount all equipment thereon. Conductors serving a gutter shall be extended without reduction in size for the entire length of the gutter. Tap-offs to the switches and other items serviced by the gutter shall be made with Penn-Union and Anderson compression connectors for aluminum conductors. Properly tape and insulate.

2.13 Outlet Boxes

- A. Standard type with knockouts made of hot dipped galvanized steel. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger if required due to number of wires.
- B. Boxes shall be provided with approved 3/8" fixture studs where required. Except when located in exposed concrete block switch and receptacles boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches. Use Racor square block boxes for exposed block walls. By Steel City, Racor, National or Appleton.

2.14 Safety Switches

- A. Furnish and install safety switches as indicated on the drawings. Switch to be NEMA Heavy Duty type HD and Underwriters' Laboratories listed. Safety switches to be G.E., Cutler Hammer, Sylvania or Square D Heavy Duty type.
- B. Appropriately identify each safety switch by engraving micarta name plate.

2.15 Fuses

- A. Branch feeder fuses to be Bussman Manufacturing Company dual element and fusetrone. Main switch fuses to be Bussman Manufacturing Company dual Hi-Cap. Fuses to be used only where indicated on drawings. Equals by Littell Fuse accepted.

2.16 Manual Motor Switches

- A. Thermal overload protection to be provided for single phase motors by manual switches with overload units rated as required by specific motor to be served. Manufactured by Cutler Hammer or Square D with NEMA Type 1 enclosure.

2.17 Wiring Devices

- A. Switches shall be A.C. type as made by Hubbell, P & S, Sierra, Bryant, Slater or Arrow Hart as shown on the drawings.
- B. Receptacles shall be Hubbell, Bryant, P & S, Sierra, Slater or Arrow Hart as shown on the drawings.
- C. Wiring devices shall be gray with stainless steel plates, beige with brass, ivory with ivory bakelite, brown and brown bakelite.

2.18 Special Purpose Receptacles

- A. Special purpose receptacles (other than 120V, 20A) shall be complete with a matching cord grip cap of the same manufacturer. See plans for special receptacles required in various locations.

2.19 Floor Outlets

- A. Floor outlets shall be an adjustable, galvanized floor box finished with accessories as required for a complete installation for power or communications. Except as identified otherwise on the plans, use Type "A" outlets as follows:
 - 1. Type "A" Outlet: Power outlets shall be Hubbell #2429 floor box finished with #S-2425 brass plate, #SC-3091 service fitting, receptacle and required accessories. Signal outlets shall be the same except #SC-3090 service fitting.
 - 2. Type "B" Outlet: Power outlets shall be Hubbell #2429 floor box finished with #S-3825 brass plate and complete with duplex receptacle and required accessories. Signal outlets shall be the same, less receptacle and with #S-2425 plate and #S-3086 nozzle furnished to the Owner.
 - 3. Type "C" Outlet: Power outlets shall be Hubbell #B-2529 floor box furnished with #S-3042 carpet flange and #S-3040 service fitting with duplex receptacle. Signal outlets shall be the same, except with #S-3041 service fitting.
- B. Where equipment is to be connected above floor level, delete service fitting and nipple or flex to connection from threaded brass floor plate.

2.20 Finishes

- A. All electrical items (device and telephone plates, junction, floor outlets, under-floor duct junctions, outlets, and other miscellaneous items) to match finish of building hardware in area installed. Unfinished areas with exposed conduit, shall have surface mounted boxes, gray switches and outlets, galvanized metal plates with beveled edges. All outlets to be gray with stainless steel plates.

2.21 Fixtures

- A. Fixtures shall be furnished as shown in fixture schedule on drawings. It shall be specifically the responsibility of this Contractor to verify exact type ceiling and recessing depth of all recessed fixtures, prior to any purchasing of fixtures. Stems shall be approved ball aligner type swivel 30 degrees from vertical and swivel below canopy. Paint stems

same color as fixture trim. Stems in unfinished areas to be unpainted conduit.

2.22 Ballasts

- A. Ballasts shall be (General Electric Maxi Miser II or approved equal by Jefferson, Universal or Advance) (electronic, rapid start, parallel wired with total harmonic distortion of less than 20%. Ballast must be approved by E.T.L. and have a noise level rating in accordance with I.E.S. recommendations. Use ballasts approved for the use in fire-rated ceilings. Provide fuse for each individual ballast. (Ballasts shall be by Advance, Motorola or Magnetek).

2.23 Lamps

- A. Furnish and install 125 volt inside frosted incandescent lamps of proper wattage for all outlets so designated on the drawings. Lamps to be G.E. Company, Sylvania, or Phillips.
- B. Furnish and install fluorescent, mercury vapor and quartz lamps of proper size and type as shown on drawings. Lamps to be G.E. Company, Sylvania or Phillips. (Fluorescent lamps shall be F32T8/SP35 with a minimum CRI of 75.)
- C. All lamps shall be installed new, immediately prior to final inspection, and shall not be used for construction purposes.

2.24 Guarantee and Warranty - Lamps

- A. The guarantee and warranty shall apply to lamps as follows:
 - 1. LED Fixtures: Per manufacturer's warranty period for LED driver.
- B. Guarantees shall begin from date of final acceptance.

2.25 Panelboards

- A. Furnish and install circuit breaker lighting panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be equipped with thermal-magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule.
- B. Circuit breakers shall be Square D type QOB (bolt-on) thermal-magnetic, molded case circuit breakers. Breakers shall be 1, 2 or 3-pole with an integral crossbar to assure simultaneous opening of all poles in multipole circuit breakers. Breakers shall have an overcenter, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have "ON", "OFF" and "TRIPPED" positions. In addition, trip indication shall include a VISI-TRIP indicator appearing in the window of the breaker case. Bolt-on (NQOB) circuit breakers shall be able to be installed in the panelboard without requiring additional mounting hardware. Circuit breakers shall be UL listed in accordance with UL Standard 489 and shall be rated 240 volts ac maximum with continuous current ratings as noted on the plans. Interrupting ratings shall be 65,000 rms symmetrical amperes maximum at 240 volts ac maximum. Single pole, 15 and 20 ampere circuit breakers intended to switch fluorescent lighting loads on a regular basis shall carry the SWD marking.
- C. Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests,

conducted in accordance with UL Standard 67. Bus structure shall be insulated. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or phase sequence type and shall accept bolt-on (NQOB) circuit breakers. All current carrying parts of the bus structure shall be plated.

- D. The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust resistant steel. Each front shall include a door and have a flush, cylinder tumbler-type lock with catch and spring-loaded stainless steel door pull. All panelboard locks shall be keyed alike. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. Doors shall be mounted with completely concealed steel hinges. Fronts shall not be removable with door in the locked position. Each front shall be furnished with a "hinged trim" accessory. Column width fronts shall have exposed hinges and be screw cover type. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door.
- E. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the overcurrent devices mounted in the panelboard. The short circuit tests on the overcurrent devices and on the panelboard structure shall be made simultaneously by connecting the fault to each overcurrent device with the panelboard connected to its rated voltage source. Method of testing shall be per Underwriters Laboratories Standard UL 67. The source shall be capable of supplying specified panelboard short circuit current or greater. Testing of panelboard overcurrent devices for short circuit rating only while individually mounted is not acceptable. Also, testing of the bus structure by applying a fixed fault to the bus structure alone is not acceptable. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.
- F. Panelboards shall be listed by Underwriters Laboratories and bear the UL label. When required, panelboards shall be suitable for use as service equipment. Panelboards shall be by Square D, General Electric, or Siemens.

2.26 Fire Alarm System

A. General

1. The contractor shall complete additions and alterations to existing low voltage, automatic and manual addressable fire alarm system, as specified herein and indicated on the drawings. The system shall include a central control panel, power supply, signal initiating devices, annunciator, remote station equipment, audible and visual alarm devices, provisions for connections to municipal fire circuits, a conduit and wiring system, all necessary devices required to provide a complete operating system.
2. The system shall comply with the applicable provisions of the current National Fire Protection Association Standard Number 72, and meet all requirements of the local authorities having jurisdiction. All equipment and devices shall be listed by the Underwriters' Laboratories, Incorporated or approved by the Factory Mutual Laboratories.
3. To establish the type and quality of system desired, the equipment specified is that

of Notifier Company. No deviation will be considered unless submittals are received and approved, in writing, not less than ten (10) days prior to bid date. Edwards is an approved equal.

B. Control Panel (Existing)

1. Notifier Addressable Model with receiving and alarm zones per plans and battery standby power, shall provide for the connection of alarm circuits as indicated and shall include functions as follows:
 - a. Detect the operation of any signal initiating device.
 - b. Indicate on LCD display the device(s) alarming.
 - c. Operate all alarm and auxiliary devices.
2. The Control Panel includes the following features:
 - a. A green pilot lamp 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 lamp to go out.
 - b. A trouble lamp and trouble buzzer, operating together, shall signal any trouble condition. Failure of the building service supply, disarrangement in system wiring, or alarm condition shall cause that trouble lamp to come on and trouble buzzer to sound. A self-restoring silencing switch shall be provided to silence the trouble buzzer, which shall be so arranged that the trouble lamp will remain on until the system is restored to normal.
 - c. All alarm signals shall be automatically locked in at the Control Panel until the operated device is returned to it's normal condition, and the Panel is manually reset. A switch shall be provided on the Control Panel for silencing the alarm devices. The manual reset switch and the alarm silencing switch shall be of the self-restoring type, which cannot be left in an abnormal position.
 - d. Each signal initiating circuit and each alarm circuit shall be represented on the Control Panel by an amber trouble lamp and a red alarm lamp. The lamps for each circuit shall be identified by a lettered name plate showing the circuit number and/or zone designation. Circuit trouble shall be indicated by the amber trouble lamp lighting. An alarm shall be indicated by both the amber trouble lamp and the red alarm lamp lighting. Audible trouble and alarm devices shall function as herein before specified.
 - e. Each circuit shall include individual supervisory and alarm relays, and shall be so arranged that a fault condition in any circuit, or group of circuits, will not affect the proper operation of any other circuit.

Provide Transient Voltage Surge Suppression at FACP, for both the incoming power supply and the outgoing connection to the remote station receiving unit.

C. Power Supply

1. Shall be 24 volt D.C., filtered and regulated, and shall provide sufficient power for all system functions.
2. The fire alarm system main power supply shall operate from 120 volt A.C. This connection shall be made in conduit or cable in accordance with local and national codes. Separate over-current protection shall be provided, marked "FIRE ALARM".
3. The 120 volt A.C. main power shall be converted to low-voltage direct current for system operation. The system shall operate on 24 volts D.C. with trickle charged batteries provided as an emergency source of supply for operating the system in the event of the 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. Fire Alarm Pull Stations

Shall be Notifier Type NBG-12LX flush mounted with FMM-1(A) monitor module. Stations with two sets of contacts will not be acceptable.

E. Smoke Detectors

Notifier Model FSP-851 photoelectric smoke detector, dual chamber design shall be installed where shown on plans.

Type InnovairFlex Duct Housing with photoelectric detector, sampling tubes and shutdown relay shall be installed in air-handling system duct work where shown on plans. Optional feature for actuation of contact closure for fan shut-down and/or damper closure on alarm shall be provided in Control Panel. Remote indicator shall be provided.

Contractor shall wire System such that if the System goes into alarm (any zone), all HVAC units will be shut down.

F. Heat Detectors

Model FST-851 heat detectors, combination fixed temperature and rate of rise, 135 degree F or 190 degree F (Model HD-84), shall be installed where shown on the plans.

G. Signaling Devices

Notifier Model SHG24-1575WR Combination Horn-Strobe unit shall be installed where shown on plans. Notifier Model GXS-4-1575WR Strobe Unit shall be installed where shown on plans. Notifier Model SPK4-24-1575 combination Speaker-Strobe shall be installed where indicated on the plan. All Horn-Strobe units shall meet ADA requirements. Make separate connections to horns and to strobes to permit strobes to operate after system is silenced.

H. Wiring

1. All wiring shall be in accordance with the NATIONAL ELECTRICAL CODE and the local code having jurisdiction. Unless otherwise specified, minimum wire size shall be 12 gauge for A.C. and power supply connections, 14 gauge for audible alarm and

auxiliary circuits, and 14 gauge for signal initiating circuits. Typical diagrams shall be provided for devices and power wiring.

2. Wiring shall be run in conduit. In general the wiring shall consist of:

From the Control Panel.

- a. West Penn No. 995 shielded twisted pair common to all Fire Alarm Stations or Detectors.
- b. 4#14 wires common to each circuit of Fire Alarm Signals.

I. Certified Fire Alarm Contractor

1. The Certified Fire Alarm Act requires that the company installing the fire alarm system must be licensed as a Certified Fire Alarm Contractor. The contractor must have a NICET Level III Technician in a position of responsibility, and the license must be issued in the name of the certificate holder and the contractor. The Certified Fire Alarm Act also requires that technicians working for the Certified Contractor must hold a current NICET Level II, or equivalent, certification. Contractors wishing to bid this project will be required to show evidence at the pre-bid conference that he/she meets the certification requirements of the Certified Fire Alarm Act and holds a permit/license issued by the State Fire Marshall.

J. Testing, Guarantee And Service

1. A Factory trained representative of the manufacturer shall supervise final testing of the system and it shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system. The Owner shall be provided with a written verification of this inspection and certification.
2. The Fire Alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from date of acceptance or beneficial occupancy; whichever earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.
3. The equipment manufacturer shall be represented by a service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall furnish, gratis to the Owner, a one year maintenance and inspection Contract, effective from the date of final acceptance. The contract shall provide for four inspections during the contract year.

2.27 Sound System

A. General

The contractor shall complete alterations and additions to the existing Sound System as specified herein as shown on the plans together with all equipment and accessories required to provide a complete operating System. The System shall be installed by a factory trained sound system contractor for the equipment manufacturer.

The entire System shall be guaranteed for a period of one (1) year from the date of final acceptance of the installation and any defective equipment or parts shall be replaced or

repaired, during the guarantee period, at no cost to the Owner.

The manufacturer and model numbers are provided to establish quality of equipment and operating requirements for the system. Any proposed substitution of equipment must be approved by the Architect within ten days prior to bid date. No substitution will be permitted after the project bid date.

B. Console

The existing Control Console is a Dukane Console.

C. Intercom Ceiling Speakers

All speakers shall be ceiling or wall mounted as shown on the plans and shall consist of 8-inch speaker with 10-ounce ceramic magnet, 25 volt tapped line, matching transformer, baffle and enclosure. The classroom speaker shall be SOUNDOLIER C10T25 with 62-8 baffle, CS 98-8 enclosure, and 180-2 T-bar support channels. Wall mounted speakers shall be flush wall mounted with SOUNDOLIER 164-8 baffle and 191-78 backbox.

D. Call-In Switch

The classroom call-in switch shall be designed for light annunciator call-in and shall consist of momentary pushbutton switch with stainless-steel face plate. The call-in switch shall be Dukane CA10.

E. Sound System Existing

The Sound System is existing and this contractor shall make additions as called for on the drawings and specifications. Speakers and Call-in Switches added shall be compatible with the existing system. If the addition over loads the existing amplifier then this contractor shall expand the system or replace it to accommodate the existing plus additions.

F. Sound System Installation

1. All wiring shall be in accordance with the local national codes.
2. Wiring shall be run in conduit except where accessible above lay-in ceilings. The wiring shall consist of the following:
 - a. West Penn 357 cable from amplifier to speakers.

2.28 Cafeteria Sound System

A. General

1. Description

- a. The cafeteria sound system shall consist of microphone, amplifier, speaker systems, and accessories required to provide a complete operating system.

2. Substitutions

- a. Any proposed substitution of equipment or materials from that specified must be approved by the Engineer within ten (10) days prior to the bid date.

- b. All proposed substitutions shall clearly identify the item submitted. Standard catalog sheets shall be marked, in ink, so as to identify which item is to be considered. All drawings submitted must be by factory as field drawings will not be accepted.

B. Products

1. Microphones

- a. The wireless microphone system shall consist of two (2) Shure BLX24R/SM58 kits with one handheld microphone each and shall be rack mountable.

2. Mixer-Amplifier

- a. The digital mixer-amplifier shall provide six (6) individually controlled inputs, master volume control, bass and treble controls. The digital mixer-amplifier shall be Atlas Sound AA200PHD.

3. CD Player

- a. The CD/Media player shall be 19 inch rack mounted and shall be DENON DN-500CB.

4. Master Power Panel

- a. Provide master power control panel which shall control AC power to all amplifier equipment from a single on-off switch. The master AC power panel shall be Middle Atlantic PD915R.

5. Equipment Rack

- a. The portable equipment rack shall be Gator Cases Model GR-8L and will require a custom blank panel with Neutrik NL4MD Speak-on connector with speaker output for connecting to wall plate.

6. Wall Input Plate

- a. Wall plate shall be mounted as shown on drawings and include Neutrik NL4MD Speak-on connector for connecting output of rack to ceiling speaker assemblies.

7. Speaker Systems

- a. Ceiling speakers shall be Atlas Strategy III Series FAP-63T-W.

8. Cables

- a. Speaker cable shall be West Penn No. 226.

C. Guarantee

- a. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

- b. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

D. Test Equipment

1. The contractor shall perform a test, equalization and balance of the sound reinforcement system using the listed test equipment. At the end of the test, the contractor will demonstrate the performance of the system to the satisfaction of the owner's designated representative. The demonstration of the system performance shall be conducted by a qualified systems engineer. The system must be fully operational and with all components properly labeled and identified with engraved nameplates prior to requesting system checkout.
2. The contractor shall furnish the following minimum list of test equipment for use during system testing, checkout and equalization:
 - a. One Third Octave Real-Time Analyzer and Reference Microphone:

Preamp interface and M30 reference microphone. Alternate products are as manufactured by Goldline, Crown, Ivie or approved equal.
 - b. Sound Pressure Level Meter: Bruel and Kjaer, General Radio, or included with RTA.
 - c. Random (Pink) Noise Generator: Goldline, Crown, Ivie or approved equal.
Digital RMS Volt-Ohm Meter: Fluke Impedance
Meter: Sennheiser ZP-2, ZP-3 or Gold Line ZM1.
3. All test equipment shall be provided with evidence of factory calibration and verification within one year of use. All batteries, connectors, etc. shall be in good repair and charge state.

E. Cleaning

1. Clean all equipment of construction dust and debris prior to final acceptance.
2. After completing installation of exposed, factory-finished components, inspect exposed finishes and repair damaged finishes.

F. Demonstration

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain all equipment. This shall consist of at least one (2) hour training session scheduled at the owner's convenience and shall cover operation of all components and the control systems including a basic seminar on systems operation.

2.29 Computer Cabling System

A. General

1. This document defines the products and the execution requirements required to furnish and install a complete distribution system utilizing a structured cabling system.

- a. All cables and related terminations, support and grounding hardware shall be furnished, installed, tested, and documented by the structured cabling contractor as detailed in this document.
- b. The distribution system shall be all inclusive and represent a complete installation at the sites shown on the attached drawings and in the attached specifications. The structured cabling contractor shall be responsible for all parts, labor, and all other associated apparatus necessary to completely install, test and turnover for acceptance to the Customer the cabling system detailed herein.
- c. Product specifications and general design considerations are provided in this document. Quantities of telecommunication outlets, typical installation details, cable routing and outlet types will be provided in the contract drawings. The successful structured cabling contractor shall meet or exceed all requirements for the cable system described in this document and as indicated in the contract drawings.
- d. Refer to contract drawings for additional requirements to include color coding of faceplates, jacks and cables, labeling, installation, etc.

B. Related Requirements

1. Drawings and general provision of Contract, including General and Supplementary Conditions, Division-1 Specification, and Division 16 Electrical sections apply to work in this section.

C. Reference Standards

1. Note use the latest ratified codes and standards for the following:
 - a. ANSI/TIA/EIA-568 Commercial Building Telecommunications Cabling Standard.
 - b. ANSI/TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.
 - c. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - d. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - e. ANSI/TIA/EIA-526 Measurement of Optical Power.
 - f. ANSI/TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard.
 - (1) Install cabling in accordance with the most recent edition of BICSI publications.
BICSI-Telecommunications Distribution Methods Manual.
 - (2) BICSI-Installation Transport Systems information Manual.
 - (3) BICSI-Network Design Reference Design Manual.
 - (4) BICSI-Outside Plant Design Reference Manual.
2. Federal, State and local codes, rules, regulations, and ordinances governing the work, are fully part of the specifications as if herein repeated or hereto attached.

3. If the contractor should note items in the drawings or the specifications, construction of which would be a code violation(s), promptly call them to the attention of the owner's representative in writing.
4. All material shall be listed by UL or other national independent testing standard shall apply.
5. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The structured cabling contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
6. This document does not replace any code, either partially or wholly. The structured cabling contractor must be aware of local codes that may impact this project.
7. MER- Main Equipment Room
8. TER- Telecommunication Equipment Room

D. Approved Contractor

1. The structured cabling contractor is responsible for workmanship and installation practices in accordance with the manufacturer's written policies.
2. The cable and connectivity manufacturer will extend a manufacturer's warranty for all products installed in this project to the end user once the structured cabling contractor fulfills all requirements under these specifications.
3. The structured cabling contractor must provide a reference list with contact names and phone numbers for three (3) projects of similar scope.
4. Structured cabling contractor must be a certified contractor with a connectivity manufacturer specified in this document and be in good standing with manufacturer's 25-year warranty program. A copy of the manufacturer's certification documents must be submitted with the product submittals in order for such quote to be valid.
5. Structured cabling contractor must have a current Registered Communications Distribution Designer (RCDD) on staff and be responsible for this project. RCDD credentials shall be submitted with bid.
6. The owner reserves the right to require the structured cabling contractor to remove from the project any such employee the owner deems to be incompetent, careless or insubordinate.
7. All clean up activity related to work performed will be the responsibility of the structured cabling contractor and must be completed daily before leaving the site.

E. Submittals

1. See Section 01300 - Administrative Requirements, for submittal procedures.
2. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog information), and samples required by the contract documents. Submit shop drawings, product data, country of origin and samples with such promptness and in such sequence as to cause no delay in the work or in the activities of other contractors. The engineer/designer will indicate approval of shop drawings, product data, and samples

submitted to the engineer by stamping submittals "APPROVED" with a stamp. Submitted shop drawings shall be initialed or signed by the structured cabling contractor's legitimate firm name.

- a. By submitting shop drawings, product data, and samples, the structured cabling contractor acknowledges that he/she carefully reviewed and verified materials, quantities, field measurements, and field construction criteria related thereto. It also demonstrates that the structured cabling contractor has checked, coordinated, and verified that information contained within shop drawings, product data, and samples conform to the requirements of the work and of the contract documents. The engineer/designer remains responsible for the design concept expressed in the contract documents as defined herein.
 - b. The engineer's/designer's approval of shop drawings, product data, and samples submitted by the structured cabling contractor shall not relieve the structured cabling contractor of responsibility for deviations from requirements of the contract documents, unless the structured cabling contractor has specifically informed the engineer/designer in writing of such deviation at time of submittal, and the engineer/designer has given written approval of the specific deviation. The structured cabling contractor shall continue to be responsible for deviations from requirements of the contract documents not specifically noted by the structured cabling contractor in writing, and specifically approved by the engineer in writing.
 - c. The engineer's/designer's approval of shop drawings, product data, and samples shall not relieve the structured cabling contractor of responsibility for errors or omissions in such shop drawings, product data, and samples.
 - d. Storage and handling requirements and recommendations.
 - e. Installation method.
3. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI RCDD.
4. Submit proof from manufacturer's good standing in manufacturer's warranty program.
5. Submit letter from manufacturer stating that the manufacturer will provide 25-year performance warranty that covers labor, material and applications.
6. Submit copy of structured cabling contractor's RCDD certification.
7. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least ten (10) days prior to intended test date.
8. Upon request by the engineer/designer, furnish a list of references with specific information regarding type of project and involvement in providing of equipment and systems.
9. Submit references as required.
10. At completion of project, structured cabling contractor shall submit the following
 - a. Copper certification test results, computer generated hard copy and diskettes.

- b. Optical fiber power meter/light source certification test results in computer generated hard copy and in diskettes.
- c. Project Record Documents: Prepared and approved by RCDD.
 - 1) Submit scale drawings for each 1/2" = 1'0"- drawing for each MER and each TR showing all racks, patch panels, 110 blocks etc.
 - 2) Identify distribution frames and equipment rooms by room number on contract drawings.
 - 3) Copper certification test results printouts and diskettes.
 - 4) Optical fiber power meter/light source test results.
 - 5) Labeling and administration documentation.
 - 6) Manufacturer's 25-year warranty certificate.
- 11. Work shall not proceed without the engineer's approval of the submitted items.
- 12. The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

F. Quality Assurance

- 1. The structured cabling contractor shall be fully capable and experienced in the structured cabling system specified. The contractor shall have at least 3 years' experience in structured cabling.
- 2. The structured cabling contractor shall employ a project manager who is a RCDD.
- 3. Equipment and materials of the type for which are independent standard testing requirements, listings, and labels, shall be listed and labeled by the Independent testing laboratory.
- 4. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout installation.
- 5. Product Requirements:
 - a. Product shall be manufactured by an ISO 9001-2000 Certified Facility.
 - b. Product shall be free from defects in material and workmanship.
 - c. Manufacturer must have a field representative who is industry qualified to provide quality control inspections during the life of the project.

G. Delivery, Storage, and Handling

- 1. Products must be stored according manufacturer's recommendations as a minimum.
- 2. Keep stored products clean and dry.
- 3. If the structured cabling contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the owner.

H. Drawings

- 1. It shall be understood that the electrical details and drawings provided with the

specification package are diagrammatic. They are included to show the intent of the specifications and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowance in bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

2. The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.
3. Prior to submitting the bid, the structured cabling contractor shall call to the attention of the engineer in writing any materials or apparatus the structured cabling contractor believes to be inadequate and to any necessary items of work omitted.

I. Warranty

1. See Section 01780 - Closeout Submittals, for additional warranty requirements.
2. The structured cabling contractor shall provide a manufacturer's warranty to guarantee end-to-end high performance cabling systems that meet application requirements. The guarantee shall include horizontal and backbone cable and connectivity components, and have one point of contact for all cabling system issues. The system shall be warranted for a period of at least 25 years and shall meet or exceed the EIA/TIA standards as specified.
3. Materials and workmanship hereinafter specified shall be fully guaranteed by the structured cabling contractor for a one (1) year period after date of substantial completion against any defects. Defects which may occur as the result of faulty materials or workmanship within one year after installation and acceptance by the customer shall be corrected by the structured cabling contractor at no additional cost to the customer. The structured cabling contractor shall promptly, at no cost to the customer, correct re-perform (including modifications or additions as necessary) any nonconforming or defective work within one (1) year after completion of the project of which the work is part.

J. Products

1. Equivalent Products

- a. Due to the nature and type of communications, all products, including but not limited to racks, patch panels, jacks, faceplates, patch cords, shall be manufactured by Panduit, Hubbell or Hellermann Tyton.
- b. All copper and optical fiber cable shall be manufactured by Hitachi Cable Manchester (HCM), General Cable, Panduit, Hubbell or Southwire.
- c. Provide products of manufacturers as named in individual articles.
- d. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.
- e. The request for substitutions must be received fourteen (14) days prior to bid opening by engineer in writing, listing any and all physical and technical differences between product specified and product request for substitution. Product samples of each item must accompany written request.
- f. Accepted substitutions will only be approved by means of addendum.

2. Approved Products

3. Work Area Outlets

- a. Work area outlets shall each be terminated at their designated work area location in the connector types described below.
- b. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the structured cabling contractor shall submit the proposed configuration for each outlet assembly, with labeling, for review by owner.
- c. The wiring scheme for this project shall be T568B unless otherwise directed by customer.
- d. Modular Jack:
 - 1) Shall meet or exceed Category 5E or 6 EIA/TIA standard.
 - 2) Where color is not indicated coordinate with engineer prior to installation.
 - 3) Approved Product:
 - a) Hubbell - Mayer Electric part #HUBHXJ6XX Color as indicated on contract drawings
 - b) Panduit - Mayer Electric part #PANCJ688TG** Color as indicated on contract drawings.
 - c) Hellermann Tyton – Mayer Electric part #TYTRJ45FC6-XXX Color as indicated on contract drawings.
- e. Modular Jack for Wireless Access Point:
 - 1) Contractor shall install a minimum of two (2) Category 6 Green cables and a minimum of two (2) Category 6 Green jacks for each wireless access point location.
 - 2) Approved Product:
 - a) Hubbell - Mayer Electric part #HUBHXJ6GN Green in color as indicated on contract drawings
 - b) Panduit - Mayer Electric part #PANCJ688TGGN
 - c) Hellermann Tyton – Mayer Electric part #TYTRJ45FC6-GRN
- f. Category 6 UTP Patch Cords:
 - 1) Category 6 patch cords shall be factory terminated with modular plugs featuring a tangle-free latch design and clear strain-relief boots to support easy moves, adds and changes (MACs). Each patch cord shall be 100% performance tested at the factory to the TIA/EIA Category 6 standard.
 - 2) Patch cord shall be included in manufacturer's 25-year warranty.
 - 3) Structured cabling contractor shall provide to customer at end of project:
 - a) One (1) patch cord for each data cable installed in each MER/TER. Patch cord length shall be capable of being installed from patch panel to customer equipment.
 - b) One (1) 16ft patch cord for each data cable installed in work area.
 - c) One (1) Patch cord for each voice cable installed in each MER/TER. Patch cord length shall be capable of being installed from patch panel to customer equipment.

- d) One (1) 25ft patch cord for each wireless access point cable in work area.
- e) One (1) patch cord for each wireless access point cable installed in each MER/TER. Patch cord length shall be capable of being installed from patch panel to customer equipment.
- f) Patch cord color shall match the color of jack and cable.
- g) Approved Product:
 - (1) Hubbell
 - (2) Panduit
 - (3) Hellermann Tyton

g. Fiber Optic Patch Cords

- 1) Structured cabling contractor shall provide four (4) LC to SC 3-meter multimode OM3 fiber optic patch cords for each TER.
 - a) Approved Product:
 - (1) Hubbell –
 - (2) Panduit
 - (3) Hellermann Tyton – Mayer Electric part #TYTFA3LCSC10G

h. Horizontal Patch Panels

- 1) The voice and data cables shall be installed in separate patch panels and in separate racks or as indicated on plans. The camera cables shall also be in a separate rack.
- 2) All patch panels shall be 48-port modular design.
- 3) All voice patch panels shall be 48-port modular.
- 4) All data patch panels shall be 48-port modular design.
- 5) Fully populate all ports with Category 6 jacks to match the color of the work area outlets.
- 6) The mixing of colors will not be allowed.
 - a) Approved Product:
 - (1) Hubbell - Mayer Electric part #HUBUDX48E
 - (2) Panduit- Mayer Electric part#PANCPL48WBLY
 - (3) Hellermann Tyton – Mayer Electric part #TYTPP110C6-48

i. Faceplates

- 1) Approved Product:
 - a) Hubbell - Mayer Electric part #HUBSSFLxx (stainless steel; match electrical. Number of ports as required)
 - b) Panduit
 - c) Hellermann Tyton – Mayer Electric part #TYTFPDUAL-SS

j. Lightning Protection

- 1) Structured cabling contractor shall provide lightning protection for any copper communication cable installed under this contract that enters or leaves a

building.

a) Approved Product:

- (1) Circa
- (2) Pre-approved equal

k. J-Hooks

- 1) The J-hook cable support shall be manufactured for use in air-handling space. The cable support must maintain complete horizontal and vertical 1" bend radius control and must manage up to 50 four pair UTP cables. Do not exceed EIA/TIA standards or manufacturer's recommendations on number of cables installed in each cable support.
- 2) Approved Product:
 - a) B-Line – Mayer Electric part #BLNBCHxx
 - b) Dynacom
 - c) Caddy
 - d) T&B

l. Fiber Patch Panel

- 1) Shall mount in standard 19" EIA rack or cabinet. Shall have front and rear access on all modules via molded-hinged doors. Must have radius control and cable management for fiber patch cords. Shall have multiple cable entry locations. Include fiber optic cable routing kit (grommets, cable ties, saddle clips, strain relief bracket and ID/caution labels for various cable management solutions.
 - a) Approved Product:
 - (1) Hubbell
 - (2) Panduit
 - (3) Hellermann Tyton

m. Multimode Fiber Adapter Panels OM3 50/125 um

- 1) All adapter panels shall use zirconia ceramic split sleeves. Use blank adapters in each empty port.
- 2) All ports shall be duplex SC.
- 3) All multimode fiber panel shall be OM3 aqua in color.
 - a) Approved Product
 - (1) Hubbell - Mayer Electric part# HUBFSPSDS3AQ (6-fiber)
 - (2) Hubbell - Mayer Electric part# HUBFSPSCDS6AQ (12-fiber)
 - (3) Panduit
 - (4) Hellermann Tyton – Mayer Electric part #TYTFAP6DMMSC10G

n. Singlemode Fiber Adapter Panels

- 1) All adapter panels shall use zirconia split sleeves. Use blank adapters in each empty port. All singlemode panels shall be blue in color. All ports shall be SC.
 - a) Approved Product:

- (1) Hubbell - Mayer Electric part #HUBFSPSCDS3 (6-fiber)
- (2) Hubbell - Mayer Electric part #HUBFSPSCDS6 (12-fiber)
- (3) Panduit
- (4) Hellermann Tyton – Mayer Electric part #TYTFAP6DMMSC10G

o. Fiber Optic Connectors

- 1) Multimode fiber optic connectors shall be SC-type; OM3 50/125.
- 2) Singlemode fiber optic connectors shall be SC-type.
 - a) Approved Product:
 - (1) Hubbell - Mayer Electric part #HUBFCLC900K50GM12 (multimode)
 - (2) Hubbell - Mayer Electric part #HUBFCLC900KSM12 (singlemode)
 - (3) Panduit- Mayer Electric part #PANFSCMCXAQ (multimode)
 - (4) Panduit-Mayer Electric part #PANFSCSCBU (singlemode)
 - (5) Hellermann Tyton – Mayer Electric part #TYTPFCSC10G

p. Racks

- 1) Furnish and install a minimum of two UL listed 7ft free standing racks in each MER/TER (unless otherwise indicated on prints).
- 2) Secure racks to floor per manufacturer's instructions and install 18" equipment tray from top of each rack to wall.
- 3) Ground each rack per ANSI/TIA/EIA-607 requirements.
- 4) Maintain 36" clearance from the front and rear of rack and on one side.
- 5) Make allowances to maintain minimum of 36" of clearance from wall to back of rack mounted equipment (UPS, Switches, Hubs, etc..). Coordinate with Engineer prior to installation.
- 6) If more than one (1) rack is installed, install in a line side to side, with appropriate vertical cable management on each side and between racks.
- 7) Rack System:
 - a) Waterfall cable management shall be provided at top of each rack for protection and to maintain proper bend radius and cable support.
 - b) The rack shall be UL listed for 1000 lb. load rating. The rack shall be installed to support 19" equipment.
 - c) Approved Product:
 - (1) Hubbell - Mayer Electric part #HUBHPW84RR19 (2-post)
 - (2) Hubbell - Mayer Electric part #HUBH1F84 (4-post)
 - (3) Panduit
 - (4) Hellermann Tyton – Mayer Electric part #TYTT7RRB
- 8) Wall-mount racks:

- a) Be as specified on plans.
- b) Install horizontal and vertical cable management to support cables.
- c) Approved Product:
 - (1) Hubbell
 - (2) B-Line - Mayer Electric part #BLNSB542096FB
 - (3) Panduit
 - (4) Hellermann Tyton – Mayer Electric part #TYTWMB2BH

q. Horizontal Wire Management

- 1) Structured cabling contractor shall install horizontal front & rear management above, between and below each copper 48-port patch panel. Horizontal wire management shall be capable of managing the maximum number of patch cords.
 - a) Approved Product:
 - (1) Hubbell - Mayer Electric part #HUBHC219CE3N
 - (2) Panduit
 - (3) Hellermann Tyton – Mayer Electric part #TYTWMB2BH

r. Vertical Cable Management and Doors

- 1) Cable management shall be provided on each side and between each set of racks, using the vertical cable management system. Structured cabling contractor to confirm vertical cable management will support number of cables installed with 25% growth for future. Doors are required to be installed on all vertical managers.
- 2) Approved Product:
 - a) Hubbell - Mayer Electric part #HUBBS76H
 - b) Hubbell - Mayer Electric part #HUBXS0610
 - c) Hubbell - Mayer Electric part #HUBXS0615
 - d) Hubbell - Mayer Electric part #HUBVS73H (Install on back rails of 4-post racks; 10" Vertical manager front only)
 - e) Panduit
 - f) Hellermann Tyton – Mayer Electric part #TYTVWMDS4X5BK7H

s. Rack-Mount Power Strip

- 1) Structured cabling contractor shall install one (1) UL listed rack-mount 20 amp power strip with circuit breaker in each floor mount or wall mount rack.
 - a) Approved Product:
 - (1) Hubbell - Mayer Electric part #HUBPR10120
- 2) Telecommunications Grounding Busbar and Accessories.
 - a) Approved Product:
 - (1) Hubbell - Mayer Electric part #HUBRKTGB (TMGB)
 - (2) Hubbell - Mayer Electric part #HUBMCCGBAR (rack mounted grounding bus)
 - (3) Panduit - Mayer Electric part #PANGB4B0624TPI-1(TMGB)
 - (4) Panduit - Mayer Electric part #PANGB2B0312TPI-1 (TGB)
 - (5) B-Line - Mayer Electric part #BLNSBTMGB12K (TMGB)
 - (6) B-Line - Mayer Electric part #BLN57903 (rack mounted

grounding bus)

- b) Panduit
- c) Bline
- d) Other Products as required to meet all codes and standards.

t. Equipment Tray for Telecommunication Rooms

- 1) All equipment tray shall be 18" in width or as indicated on prints and UL listed. The tray shall have 1 ½" stringers and rungs that are fully adjustable from 6" to 12" spacing within the tray. The tray shall be black in color and be made of aluminum.
- 2) Furnish and install 18" equipment tray from each floor; mount rack/server cabinet to wall. Furnish and install 18" equipment tray around wall as required to support cables. (A minimum of two (2) walls shall be completely covered by equipment tray).
- 3) Furnish and install cable retaining post on each side of tray every four (4) feet as required to support cables.
 - a) Approved Product:
 - (1) B-Line - Mayer Electric part #BLNSB13AL18FB (18" Redi-Rail tray)
 - (2) B-Line - Mayer Electric part #BLNSB117ABZ (Cable retaining post)
 - (3) B-Line - Mayer Electric part #BLNSB2276FB (6" elevation bracket)

u. Horizontal Distribution Cable

- 1) All horizontal voice and data station cables shall terminate on modular patch panels in their respective telecommunication room or equipment room as specified on the drawings.
- 2) All cable, workstation jack modules and patch panel jack modules shall be the same color as designated on prints. If colors are not designated, coordinate color with engineer.
 - a) UTP cabling - Horizontal Copper Cable; Category 6 Cable
 - b) Cable construction shall be four (4) twisted pairs of 23 American Wire Gauge (AWG) insulated solid bare annealed copper conductors.
 - c) Outer jacket shall meet National Electrical Code (NEC) requirements and have a nominal cable diameter not to exceed 0.235" for communications riser (CMR) and 0.225" for communications plenum (CMP).
 - d) Cable shall have a minimum 1.0" bend radius.
 - e) Delay Skew (max) 38ns/100m.
 - f) Must have positive power sum attenuation-to-crosstalk ratio (PSACR) beyond 250 MHz.
 - g) Application assurance warranty.
 - (1) All transmission performance parameters shall be independently verified by UL or ETL third party testing organization.
 - h) Approved Product:
 - (1) HCM Mayer Electric part #'s as indicated below:

- (a) HCM30025-8BL Category 6 Plus CMP Blue
- (b) HCM30025-8WH Category 6 Plus CMP White
- (c) HCM30025-8GR Category 6 Plus CMP Green
- (2) Hubbell Mayer Electric part #'s as indicated below:
 - 1a) HUBC6SPB Hubbell Category 6 CMP Blue
 - 1b) HUBC6SPW Hubbell Category 6 CMP White
 - 1c) HUBC6SPGN Hubbell Category 6 CMP Green
- (3) General Cable GS6000E
- (4) Southwire

v. Backbone Fiber Cabling System

- 1) Furnish and install a minimum of a 6-strand OM3 multimode fiber from MDF to each IDF. Any fiber length that exceeds 1600ft, furnish a minimum of a 6-strand singlemode fiber in addition to the multimode, unless otherwise indicated on backbone riser diagram.
- 2) See riser diagram.
- 3) All indoor fiber shall be tight buffered interlock armored fiber.
- 4) All indoor/outdoor fiber shall be tight buffered optical fiber nonconductive plenum (OFNP) rated and shall be installed in innerduct rated for the appropriate application.
- 5) All outdoor fiber shall be loose tube and shall be installed in innerduct rated for the appropriate application.
- 6) All multimode fiber shall be 50/125 OM3.
 - a) Approved Product:
 - (1) HCM Mayer Electric part #'s as indicated below:
 - (a) HCM61337-6 (6-strand interlock armored OFNP 50/125 OM3 300 meters 10Gig)
 - (b) HCM61337-12 (12-strand interlock armored OFNP 50/125 OM3 300 meters 10Gig)
 - (c) HCM61337-24 (24-strand interlock armored OFNP 50/125 OM3 300 meters 10Gig)
 - (d) HCM61433-6 (6-strand interlock armored OFNP singlemode)
 - (e) HCM61433-12 (12-strand interlock armored OFNP singlemode)
 - (f) HCM61433-24 (24-strand interlock armored OFNP singlemode)
 - (g) HCM61348-6 (6-strand tight buffered indoor/outdoor OFNP 50/125 OM3 300 meters 10Gig)
 - (h) HCM61348-12 (12-strand tight buffered indoor/outdoor OFNP 50/125 OM3 300 meters 10Gig)
 - (i) HCM61348-24 (24-strand tight buffered indoor/outdoor OFNP 50/125 OM3 300 meters 10Gig)
 - (j) HCM61459-6 (6-strand tight buffered indoor/outdoor OFNP singlemode)
 - (k) HCM61459-12 (12-strand tight buffered indoor/outdoor OFNP singlemode)
 - (l) HCM61459-24 (24-strand tight buffered indoor/outdoor

- OFNP singlemode)
- (2) General Cable
 - (3) Panduit

K. Network Electronics

1. All network equipment (Hubs, Switches, Routers, etc.) shall be provided and installed by owner.
2. All network equipment (Hubs, Switches, Routers, etc.) shall be provided and installed by owner.
3. Wireless electronics and supporting equipment shall be provided and installed under this contract.

L. Execution

1. Pre-Installation Site Survey

- a. Prior to start of system, meet at the project site with owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the general contractor will be necessary to plan the crucial schedule completions of the equipment room and telecommunication closet.
- b. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

2. Installation Guidelines

- a. The work included under this specification, consist of furnishing all labor, equipment, material, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specification or not.
- b. All work performed on this project will be installed in accordance with the current edition of the NEC, the current edition of The National Electrical Safety Code, the current issue of the NEC, The current edition of ANSI/NECA/BICSI-568 standard for installing commercial building telecommunications cabling, the current edition of the BICSI Telecommunications Distribution Methods Manual (TDMM), the current edition of the BICSI Cabling Installation Manual, the latest issue of ANSI/TIA/EIA standards as published Global Engineering Documents as ANSI/TIA/EIA Telecommunications Building Wiring Standards, and all local codes and ordinances. Should conflicts exist with the foregoing, the authority having jurisdiction (AHJ) for enforcement will have responsibility for making interpretation.
- c. If this document and any other documents listed above are in conflict, then the more stringent requirements shall apply. All documents listed are believed to be the most current release of the documents. The structured cabling contractor has the responsibility to determine and adhere to the most current release.
- d. This document does not replace any code, either partially or wholly. The structured cabling contractor must be aware of local codes that may impact this project. All,

local, State and federal codes are to be followed.

- e. All materials shall be UL Listed or listed by other national independent testing agency and shall be marked as such.
- f. Section Includes: Equipment, materials, labor, and services to provide a complete structured cabling system including, but not limited to:
 - 1) Furnish and install a complete telecommunications wiring infrastructure.
 - 2) Furnish, install, terminate and test all copper and optical fiber cables.
 - 3) Furnish and install raceway, boxes, and cable tray.
 - 4) Furnish and install all wall plates, jacks, patch panels, and patch cords as described.
 - 5) Furnish and install all required cabinets and/or racks as required and as indicated.
 - 6) Furnish any other material required to form a complete system.
 - 7) Perform link testing (100% of horizontal and/or backbone links) and certification of all components. All tests must meet or exceed link testing requirements as specified in this document.
 - 8) Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.
 - 9) Provide owner test results and documentation. (Testing documentation and as-built drawings).
 - 10) Removal of abandoned cable, if required.

3. Work Not Included

- a. Unless otherwise indicated, the structured cabling contractor is not responsible for providing data concentrators, hubs, switches, servers, computers, and other active devices such as PBX's.

4. Installation

- a. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local AHJ, and current NEC and with manufacturer's instructions.
- b. Install in accordance with manufacturer's instructions.
- c. All cable shall conform to the requirements for communications circuits defined by the NEC (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one (1) floor.
- d. Adhere to manufacturer's specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
 - 1) Where manufacturer does not provide bending radii information, minimum-bending radius shall be 4 times the outside diameter of the cable. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.
- e. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be fire stopped after installation and testing, utilizing a fire stopping assembly for that application.

- f. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.
- g. Installation shall conform to the following basic guidelines.
 - 1) Use of approved wire, cable, and wiring devices.
 - 2) Neat and uncluttered wire termination.
- h. Where cable tray is not used, attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables above removable ceilings.
- i. Follow manufacturer's recommendations on spacing and number and type of cables installed in j-hooks or cable tray to avoid cable stress.
- j. Separation and physical barriers between communication cabling and power cables must be maintained at all times.
- k. Install adequate support structure for 10 feet of service slack at each TR.
- l. Support riser cables every three (3) floors and at top of run with cable grips.
- m. Limit number of four-pair data riser cables per grip to fifty (50).
- n. Install cables in one continuous piece. Splices or taps will not be allowed.
- o. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.

5. Grounding

- a. Grounding shall conform to ANSI-J-STD 607(A) Commercial Building Grounding and Bonding Requirements for Telecommunications, NEC, ANSI/NECA/BICSI-568 and manufacturer's grounding requirements as minimum.
- b. Bond and ground equipment racks, housings, messenger cables, and raceways.
- c. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 (at a minimum) green insulated copper grounding conductor.

6. Labeling

- a. Label each outlet with permanent self-adhesive label.
- b. Label each cable within 1" of termination on each end.
- c. Use labels on face of patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities therein.
- d. Use color-coded labels for each termination field that conforms to ansi/TIA/EIA-606(A) standard color codes for termination blocks.
- e. Labels shall be machine-printed. Hand-written labels shall not be acceptable.

- f Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in date.
- g Three (3) sets of as-built drawings shall be delivered to the owner within two (2) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner in electronic form utilizing CAD software that is acceptable to the owner. The electronic media shall be delivered to the owner within four (4) weeks of acceptance of project by owner.

7. Testing

- a Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished using a level IIe or higher field testers.
- b All testing shall meet or exceed manufacturer's recommendation for 25-year warranty program.
- c Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded and reversed pairs.
- d If copper backbone cable contains more than one (1%) percent bad pairs, remove and replace entire cable.
- e If horizontal cable contains bad conductors or shield, remove and replace cable.
- f Test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14a: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant and ANSI/TIA/EIA-526-7 Measurements of Optical Power Loss of Installed Singlemode Fiber Cable Plant. Measure results shall be plus/minus 1 dB of submitted loss budget calculations. Correct improper splices and replace damaged cables at no charge to the owner.
 - 1) Cables shall be tested at 850 and 1300 nm for multimode optical fiber cables. Cables shall be tested at 1310 and 1550 for singlemode optical fiber.
 - 2) Testing procedures shall utilize "Method B"- one jumper reference.
 - 3) Bi-directional testing of optical fiber is required.
 - 4) Submit printout for each cable tested. The use of handwritten test results will not be acceptable.

8. Field Quality Control

- a Employ job superintendent or project manager during the course of the installation to provide coordination of work of this specification and of other trades, and provide technical information when requested by other trades. This person shall maintain current RCDD registration and shall be responsible for quality control during installation, equipment set-up, and testing.
- b Installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.

3.0 EXECUTION

3.1 Workmanship

- A. All work shall be executed in workmanlike manner and present a neat and mechanical appearance upon completion.
- B. Balance load as equally as practical on services and all feeders, circuits, and panel busses. All wiring in panelboards shall be laced and looped in a workmanlike manner.
- C. Upon completion of work, test entire wiring system and show to be perfect working order in accordance with intent of specifications and drawings. This Contractor to have all systems ready for operation and electrician available to assist in removal of panel fronts, etc., to permit inspection as required.
- D. All work shall be in accordance with the National Electrical Code and the rules and regulations of the local bodies having jurisdiction.

3.2 Excavation Cutting and Patching

- A. Provide cutting and patching required for this section of work under supervision of the General Contractor. Coordinate with other trades as work progresses so cutting and patching will be minimal.

3.3 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 not more than 1/2" clearance around pipes and insulation.
- B. Contractor shall furnish to other trades all sleeves, insert, anchors and other required items which are to be built in by trades for the securing of all hangers or other supports by the Contractor.
- C. Contractor shall assume all responsibility for the placing and size of all sleeves, inserts, etc., and either directly supervise or give explicit instructions for installation.
- D. Seal all conduits through floor, smoke or fire walls and sound barrier walls. All such penetrations shall be made with an Underwriters' Laboratories firestop assembly. Through floor conduit shall be sealed water tight.
- E. 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 steel framework. Obtain approval of Architect prior to welding.

3.4 Roof Penetrations

- A. Furnish roof flashing for all equipment installed under this section that penetrates through the roof. Galvanized sheet, 24 gauge with base extending 6" beyond pipe.

3.5 Grounding

- A. All equipment shall be grounded and bonded in accordance with local regulations and National Electrical Code. Ground main service to code size cold water pipe and driven ground rod, maximum of 2 driven rods. All conduits entering a free-standing switchboard or motor control center shall be bonded together with approved grounding lugs and bare copper wire.
- B. Interior metal water piping shall be bonded to the system ground as outlined in NEC Section 250-80.
- C. This Contractor shall bond all metal air ducts to the respective unit grounding conductor. Install additional bonding jumpers at joints, flexible sections, etc., to ensure that entire duct system is bonded.

3.6 Conduit Installation

- A. Where rigid conduits enter boxes secure in place by approved lock nuts and bushings. Where E.M.T. enters boxes secure in place with approved insulated fittings. Conduit ends shall be carefully plugged during construction.
- B. Use of running threads is absolutely prohibited. Conduits shall be joined with approved conduit couplings.
- C. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 3" of such pipes except where crossings are unavoidable, then conduit shall be kept at least 1" from the covering of the pipe crossed.
- D. Before installing raceways for motors and fixed appliances, check locations of motors and appliance connections. Locate and arrange raceways appropriately.
- E. Provide flexible conduit connections to all motors and/or any equipment which has moving or vibrating parts. Sealtite flexible conduit shall be used in all cases where exposed to moisture and in mechanical equipment rooms.
- F. Exposed conduit runs shall be parallel and/or at right angles to building walls and/or partitions.
- G. Where conduit crosses a structural expansion joint, an approved conduit expansion fitting will be installed.
- H. Leave aluminum pull wire in all empty conduit.
- I. Conduit shall be cut square and the ends reamed after threading.
- J. Fasten conduit securely in place by means of approved conduit clamps, hangers, supports, and fastening. Arrangement and method of fastening all conduits subject to Architect's direction and approval.
- K. Apply two (2) coats of asphaltum paints to all underground rigid conduit. Carefully retouch any breaks in paint and allow to dry before covering. Leave exposed until after Architect's inspection.

- L. Conduits shall be sized in accordance with National Electrical Code as amended to date, except when the size is shown larger on the drawings.
- M. Conduit with an external diameter larger than $\frac{1}{3}$ the thickness of the slab shall not be placed in the slab. Conduit in the slab shall not be spaced closer than 3 diameters on center. No conduit in porous fill.
- N. E.M.T. may be used where concealed in ceiling or walls where there is no danger of mechanical injury. Rigid conduit shall be used, where embedded in concrete, areas exposed to moisture and danger of mechanical injury, in hazardous areas, and for feeders and motor circuits. PVC shall be allowed for branch circuit conduits installed in floor slab (rigid steel 90's).

3.7 Wire and Cable Installation

- A. No conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation. Wire nuts not permitted.
- C. Multi-wire lighting branches shall be used as indicated.
- D. No splices shall be pulled into conduit.
- E. Both conductors and conduits shall be continuous from outlet to outlet.
- F. No conductor shall be pulled until conduit is cleaned of all foreign matter.
- G. In 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.

3.8 Feeder Designation

- A. Non-ferrous identifying tags or pressure sensitive labels shall be fastened securely to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchgear 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 or phase can be readily identified.

3.9 Circuits and Branch Circuits

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.10 Wire Joints

- A. On copper wire larger than #12 joints shall be made with solderless connectors and covered with Scotch #33 Electrical Tape so that insulation is equal to conductor insulation. Connectors by Penn-Union or Anderson.

- B. #12 and smaller wire joints shall be made with T & B Sta-Kon wire joints, complete with insulating caps, Ideal Wing nuts, or Buchanan Electrical Products Series 2000 pressure connectors complete with nylon snap-on insulators.
- C. Joints on aluminum cable #0 and larger shall be made with compression lugs and bolted to terminals using stainless steel bolts and Belleville washers. Torque to 50-to-60-foot pound or torque with torque wrench. Aluminum cable and joints shall be used only where indicated on drawings. Connectors by Penn-Union or Anderson. Connection to panelboard by Burndy Connector and stud.

3.11 Outlet Boxes Installation

- A. Outlet boxes shall be securely fastened.
- B. Surface Fixture outlet boxes shall be set so edge of cover comes flush with finished surface.
- C. There shall be no more knockouts opened in any outlet box than are actually required.
- D. Boxes shall be sealed during construction. Protect interiors (including panel cans) from paint and mortar.
- E. Unless otherwise shown, outlets shall be located as follows: centerline of boxes shall be following distance above the finished floor:

Receptacles General -----	1'4" - Centerline
Receptacles Over Counters -----	3'8" - Centerline
Telephone Outlets General -----	1'4" - Centerline
Wall Telephone Outlets -----	4'0" - Centerline
General Clock Outlets -----	7'6" - Centerline
Switches General -----	4'0" - Top
Fire Alarm Pulls -----	4'0" - Top
Fire Alarm Signals -----	6'8" - Bottom
Bells -----	6'8" - Centerline
T V & Computer Outlets -----	1'4" - Centerline

- F. Symbols on drawings and mounting heights as indicated on drawings and in specifications are approximate only. The exact locations and mounting heights must be determined on the job and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation, i.e., over counter in or above back splashes, in stud walls, and other specific construction features. Mount all receptacles vertical. In block walls (exposed), use nearest joint as approved by Architect.

3.12 Fixture Installation

- A. Support of all fixture shall be responsibility of this Contractor. Fixtures shall be supported independent of ceiling from structure members of building. Contractor shall submit typical hanging detail to Architect/Engineer before installing any fixtures. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.
- B. Fixture conductors shall be connected by soldering and tying or by approved connectors.

- C. All stems on fluorescent 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 "joining plates". All fixtures in continuous rows other than recessed grid type shall be connected by nipples with lock nuts and bushings.
- D. Thoroughly clean all fixture lens and reflectors immediately prior to the final inspection.

3.13 Installation of Motors, Electric Heaters, and Controls

- A. Provide feeders and make connections for motors, electric heating units and controls.
- B. An approved H.P. rated safety switch shall be provided within sight of each motor and each heating unit. Provide fused switches where branch circuit fuses are not sized for overload protection. Weatherproof switches are to be used where switches are located outdoors. Safety switches shall be as manufactured by G.E., Square D, or Cutler Hammer.
- C. Manual motor starters with thermal overload protection may be used in lieu of safety switches for motors under 1/2 H.P. Manufacturers shall be same as above.
- D. The heating and air conditioning contractor shall furnish all motor starters.
- E. The temperature control contractor shall furnish and install all low and line voltage wiring necessary for the temperature control systems and interlocking with air handling units, cabinet unit heaters.
- F. The electrical contractor shall install all motor starters, except for factory mounted. He will furnish wire and disconnect switches. He will furnish and install all power wiring from the power panels on packaged equipment. He will not furnish nor install any low and line voltage wiring necessary for the temperature control system and interlocking with air handling units, or cabinet unit heaters.

3.14 Alterations & Additions to Electrical System in Existing Building

- A. Work in existing building shall be performed as indicated or requested to perform its intended function on Electrical and Architectural plans. This contract shall include removing, relocating, extending, etc., any items of electrical nature required to facilitate work as indicated. All circuits interrupted by rework shall be extended and left energized. Contractor shall include night and weekend work in bid as required to keep all outages to a minimum four (4) hours, during non-school hours only.

3.15 Sound System Installation

- A. All wiring shall be in accordance with local and national codes.
- B. Wiring shall be run in conduit except where accessible above lay-in ceilings

3.15 Fire Alarm Installation

- A. All wiring shall be in accordance with Local and National Codes and Article 210 of the National Board of Fire Underwriters Standard Number 72. Unless otherwise specified, minimum wire size shall be 12 gauge for A.C. and power supply connections, 14 gauge for audible alarm circuits and 14 gauge for signal initiating circuits, or wire size as indicated on drawings.
- B. Wiring shall be run in conduit. In general, the wiring from the Control Panel shall consist of:
 - 1. West Penn No. 995 shielded twisted pair common to all Fire Alarm stations or Detectors.
 - 2. 4#14 wires common to each circuit of Fire Alarm Signals.
- A. A factory trained representative for the manufacturer shall supervise the final testing of the system and it shall be subject to the approval and acceptance of the responsible engineer. On completing of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.

END OF SECTION 16000

PRE-CONSTRUCTION CONFERENCE CHECK-LIST

Project: Addition and Renovations to Cafeteria at Salter Elementary School

Funding: DCM / PSCA

Location: TBD

Date/Time: TBD

DCM Insp:

Please note that all items listed below may not be applicable to this project.

1. **Introductions / Sign In**

2. **Owner's Comments**

3. **Preface / Pass Along To Others**

4. **General Contractor's Team Members (contact information)**

Project Manager: _____

Superintendent: _____

5. **Verify all alternates accepted.**

6. **E-Verify. Alabama Immigration Law. Be sure that all subcontractors comply with E-Verify requirements.**

7. **List of Sub-Contractors, submit for approval.**

A Complete list of sub-contractors must be submitted and approved by the Architect and Owner prior to any work commencing. Contractor cannot replace subs unless approved by the Architect and Owner (GCS 41)

8. **Cost Breakdown and Progress schedule.**

Cost breakdown and progress schedule must be submitted and approved on proper state forms prior to first pay request. **GC is required to provide an updated progress schedule at each OAC.**

Start:

Completion Date:

Days:

9. **Method of approving monthly pay request.**

Due by the 25th of each month. Architect will verify, sign and forward to Owner, who will forward to DCM, if applicable.

10. **Allowances.**

A. With the exception of quantity allowances, all allowances indicated are contingency allowances and therefore the Owner may transfer balances for other discretionary uses. Overhead and profit margins **SHALL NOT BE ADDED** to any amount drawn from original Allowance(s) regardless of the indicated use.

- B. Each contingency allowance shall be a "line item" on the Schedule of Values.
- C. The following allowance(s) are a part of this project:
 -
 -
- D. If applicable, note special material/equipment delivery dates associated with allowances.
 -

11. Change Orders Requests. No work prior to final approval; Architect can approve in writing if emergency.

- A. All changes in work are to be submitted via Change Order Request, regardless of monetary value.
- B. COR's must be submitted in sequential order on GC letterhead.
- C. All COR's must be broken down to the fullest degree, including breakdown of GC's cost by GC's labor, materials, subcontractor, sub-subcontractor cost and OH&P. Subcontractor and sub-subcontractor cost must be documented with copies of quotes detailing OH&P included.
- D. COR's applied to allowances cannot include OH&P.
- E. Credit COR's must include a minimum of 5% OH&P.
- F. Upon Owner and/or Architects' approval of COR's, a revised Change Order and Allowance Usage log will be sent to GC via email.
- G. GC is to maintain a COR Log and present updated copy at each OAC meeting.
- H. **NOTE: The following information is required for ALL Change Order Requests submitted:**
 - a. Each material number shall include an invoice / quote listing unit quantity, unit price, and extended total.
 - b. Each labor number shall include a breakdown showing number of laborers, hours of labor worked, hourly wage, and extended total.
 - c. Each equipment number shall have an invoice / quote listing the hours of use, hourly rate, and extended total.
- I. An official Change Order to the State **CANNOT** be prepared if all backup paperwork is not provided and accounted for.
- J. This information is required for all contractors, subcontractors, and sub-subcontractors.

12. Shop Drawings.

- A. Submittal Schedule must be submitted to Architect at or before Pre-Construction Conference. Correlate this submittal schedule with the listing of subcontractors and with list of materials as specified in contract documents. The submittal schedule should be in chronological order following the critical timing of the approval of submittals in accordance with the Work Progress Schedule.
- B. Submit all items proposed for use in work. Do not combine submittals with requests for substitutions
- C. Must bear GC's action stamp as APPROVED OR APPROVED AS NOTED. Contractor shall review and stamp approval and submit shop drawings, product data and samples far enough in advance to allow ample time for Architect review. Color selections may take

longer than actual submittal approval, but in any case, will not be given via phone calls. If submittals are not marked as approved by the GC, they will be returned without action.

- D. Digital Copies: Provide via email to submittals@lathanassociates.com. Do not send directly to Architect. **See attached Sample.**

- E. Submittal Preparation:

- **Include the following information on transmittal / email.**
 - Date
 - Project Name and Architect's Project Number.
 - Name of the General Contractor and Contact within company.
 - Subcontractor/Supplier.
- Clearly state **Number** and title of appropriate Specification Section and **Description** of Item and if applicable
 - Name of the Manufacturer.
 - Model / Style of Item

General Contractor must review and approve shop drawings and submittals prior to submitting to Architect. Allow the Architect no less than three (3) weeks for initial review. Allow more time if the Architect must delay processing to permit coordination with the sequence of construction, related specification divisions, engineers, consultants and owner's representatives. Allow no less than two (2) weeks for reprocessing.

NOTE: No extension of Contract Time and/or additional costs will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

- F. Material shall not be fabricated or work performed without approval of respective submittal.
- G. GC is to maintain copies of all approved shop drawings at the site and have available for architect and/or engineers at all times.
- H. **GC is to maintain a Submittal Log and present updated copy log at each OAC meeting.**
- I. **Important:** Contractor shall perform no portion of the work for which the contract documents require submittal and review of Shop Drawings, Data, Installer Qualifications, etc. until respective submittal has been approved by the Architect.
- J. **Important:** Submittals are not Contract Documents and are not used to make changes in scope of project or intent of Contract Documents, and not used to request or IMPLY substitutions or to otherwise make changes in project requirements.
- K. **Important:** The only changes that can be made to the project once it is bid, is through Change Order Requests and Approvals.
- L. **Important:** After receiving approved digital submittals, General Contractor is responsible for printing and delivering 2 hard copies of the approved shop drawings to the Architect within 10 days. Submittals are not considered complete until 2 copies have been received by the Architect. This may have a direct effect on pay requests or final payment.

13. **CAD Files / PDF**

- A. This project was bid under the assumption that electronic CAD files would not be available.
- B. Electronic CAD files are owned individually by each design professional according to discipline. If electronic CAD files or portions thereof are made available, be reminded that electronic CAD files can be manipulated and do not constitute the Contract Documents. The business of acquiring such files shall be between the contractor and the individual design professional. Fees may or may not be applicable. It shall be the Contractor's responsibility to investigate and procure at no added expense to the Owner.

C. PDF files shall be made available to the General Contractor for use during construction.

14. Advanced notice of required inspections.

The contractor will contact the architect by e-mail at inspections@lathanassociates.com of the date the project will be ready for an inspection by the DCM Inspector: Pre-Roofing, Fire Above Ceiling, Final, and Year End. Special Inspections shall be required for all work of the Storm Shelters and the Fire Water Lines. Schedule well in advance to prevent delays.

- Inspections must be requested 14 days in advance.
- When the DCM Inspector confirms the inspection time, the Architect will send an e-mail confirming the inspection time and date.
- Cancellations of any scheduled inspection must be received in writing by e-mail no less than 48 hours prior to the scheduled inspection. If an inspection is cancelled, it will be rescheduled subject to the DCM Inspector's availability.
- If an inspection is cancelled less than 48 hours prior to the scheduled inspection, the re-inspection fee of \$1,500 will be charged.

15. Inspection Minimum Requirements.

The following minimum requirements listed below are provided to aid the contractors and architect in determining if a project is ready for a required inspection.

- Pre-Construction Conference
 - Required Attendees: Contractor, Owner, Architect, Major Subcontractors
 - Inspection Requirements:
 - ✓ Signed construction contract
 - ✓ Verification of payment of permit fee
 - ✓ Fire Alarm Contractor's Certification (from State Fire Marshal)
 - ✓ ADEM permit, if more than 1 acre of land is disturbed
- Pre-Roofing Conference
 - Required Attendees: Contractor, Owner, Architect, Roofing Subcontractor, Roofing Manufacturer's Representative
 - Inspection Requirements:
 - ✓ 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 roofing warranty
- Above-Ceiling Inspections
 - Required Attendees: Contractor, Owner, Architect, MEP Engineers, Major Subcontractors, DCM Inspector
 - Inspection Requirements:
 - ✓ All work must be completed except for installation of ceiling tiles and/or hard ceilings
 - ✓ Space must be conditioned
 - ✓ Permanent power must be connected unless otherwise arranged with the DCM Inspector
 - ✓ Grease duct must be inspected and approved by the DCM Inspector prior to fire wrapping and Above-Ceiling Inspection

- Life Safety Inspections and Final Inspections
 - Required Attendees: Contractor, Owner, Architect, Engineers, Major Subcontractors, Local Fire Marshal, DCM Inspector
 - Inspection Requirements:
 - ✓ Fire alarm certification
 - ✓ General Contractor's 5-Year Roofing Warranty (ABC Form C-9)
 - ✓ Roofing manufacturer's guaranty
 - ✓ Emergency and exit lighting tests
 - ✓ Fire alarm must be monitored
 - ✓ Boiler/Vessels/Hot Water Heater exceeding 5 gallons Inspection completed and Certificate of Operation provided by State of Alabama Department of Labor
 - ✓ **Test and Balance Report previously accepted by Engineer**
 - ✓ Flush/pressure test for new and/or existing fire hydrants
 - ✓ Must have clear egress/access and emergency (for first responders) access to building
 - ✓ Must have ADA access completed
 - Year-End Inspections
 - Required Attendees: Contractor, Owner, Architect, Engineers and /or Major subcontractors may also be required to attend
 - Inspection Requirements:
 - ✓ Owner's list of documented warranty items
16. **Above Ceiling Inspection by the Architect, Engineers and DCM Inspector.**
 No above ceiling work is to be done after the Above Ceiling Inspection other than correction of deficiencies noted during the inspection. (Pre-Above Ceiling Inspection)
 Fire Caulking Tented fixtures Wire at Light Fixtures Debris
 Temporary Lighting Penetrations Pipe Saddles
Insulation - No Kraft - Exposed Fire-Rated FSK or FRK - Type III, Class A.
 17. **Other inspections required before work is covered.**
 - A. Local inspectors may require a full range of inspections on this project, footings, under-slab, etc. A wall inspection will be held before any finish paints are applied.
 - B. Material Testing.
 18. **Observation report distribution.**
 Architect will submit field reports promptly to the Owner, GC, DCM Inspector. Architect will fill in all blanks on the field report form.
 (GCS 16 & MP 8D)
 19. **Record drawings, definitions of procedures.**
 G.C. is to keep all changes made in the field red lined daily. Cut and paste all addendums onto the plans at their respected locations. One clean set of plans is to be secured at the job trailer at all times for review by all interested parties. This set with changes could be used as the record drawings. Final pay approval is subject to receipt of these as-built drawings.
 20. **Project sign and other job signs.**
 State required sign is the only sign allowed on project.
 Job trailers with contractor and/or sub-contractor names are allowed.
 21. **Overall phasing of project.**
 Superintendent is responsible to plan ahead in order to avoid delays and conflicts. GC is to advise Architect on delays of critical path items. Superintendent is to be on site at all times when any work is in progress; no exceptions (GCS 6A & B)

- 22. Contractor's duty to coordinate work of separate contractor.**
Contractors employed by others for installation of data, computer and etc. (GCS 40D)
- 23. Use of existing site, building and access drive.**
- A. Use of existing building site for lay down is to be determined by local owner and Architect. Local owner will advise contractor on proper route to site. Material delivery times are to be made as to not interfere with the school bus schedule. Area is to be reviewed after this meeting, if necessary. Maintain traffic flow.
 - B. No workmen are allowed in existing building, unless prior approval is granted by the Owner and arranged by the General Contractor. There is to be no communication between workers and faculty/staff or students; through vocal, looks, stares or body language.
 - C. Since most projects are hard hat areas, the worker's name will be on his/her hat for identification purposes.
 - D. If a faculty/staff member or student is causing a problem with a worker, the worker is to report the incident to the Project Superintendent. The Superintendent should then report the incident to the Owner. Under no circumstances should the Worker try and handle the problem by him/herself.
 - E. There is to be no profanity on the job site.
 - F. School Lunchroom is off limits to workers.
 - G. Use of existing site, building and access drive.
 - H. Workmen are expected to dress appropriately. Tee-shirts are expected to be non-offensive to all parties.
 - I. State school properties are tobacco free areas. No smoking, chewing, or dipping of tobacco products are allowed.
 - J. State school properties are drug free areas. Vehicles are subject to search and seizure by law enforcement authorities.
 - K. Firearms are not allowed on school property. Cased, uncased, loaded, or unloaded.
- 24. Use of existing toilets.**
There will be no use of existing toilets. G.C. is to provide proper number of toilets for all workers. School telephone is off limits.
- 25. Coordinate any utilities supplied by the Owner / New equipment.**
- A. Existing sites, normally water only.
 - B. Coordination - OAC /Sub Meetings
 - C. New equipment utilities may be different than those existing utilities that the design is based upon. Coordinate with actual equipment cut sheets submitted and approved.
- 26. Coordinate outages with Owner.**
Provide as much notice as possible. Superintendent is to verify that coolers and freezers are back on line. Coordinate with key testing date, do not disrupt on-going school operations. *Roofing fumes must be minimized with afterburner.*
- 27. Keeping existing exit paths open.**
Required exits are to be maintained at all times.
- 28. Routine job clean up.**
Debris is to be removed daily/weekly from building and site. Do not allow dumpster to spill over. Burning of trash on site is not allowed. (GCS 48, A & C)

29. **Safety is General Contractor's responsibility.**
As a courtesy, advise the Architect if there has been a problem.
30. **Project limits.**
Defined on drawings.
31. **Building location relative to critical property line. Easements, Setbacks, etc.**
Review with Architect before starting work.
32. **Location of property lines, corners, etc.**
Review with Architect before starting work.
33. **Verify sanitary outfall before committing to floor level.**
Plumber is to advise Superintendent ASAP and Superintendent is to notify Architect if there is a problem.
34. **Procedure if bad soil is encountered.**
Contact Architect immediately.
35. **Stockpiling top soil.**
On existing sites, location is to be approved by the Architect and Owner.
36. **Protect existing trees, shrubbery, landscaping, sidewalks, curbs and etc. if intended to remain.**
GC is to leave existing site in same condition as when project started.
***If disturbing more than 1 acre, discuss ADEM requirements.*
37. **Soil compaction, type soil, lab test, etc.**
Testing Engineer is to approve compaction. Soil type is listed in the specs. For lab tests, refer to the specs. Testing disclosure.
38. **Soil Treatment.**
Soil treatment provider is to come to the site with empty tank. Use on site water. Superintendent is to witness the treatment container seals broken and mix prepared. No pre-mixed material is to be brought to the site.
39. **Surveyor to check foundation wall. Location is critical.**
40. **Ready mix plant, file delivery tickets, slump and cylinder test.**
Protect cylinders until tested. Superintendent is to have on file, at all times, the delivery tickets, slump and cylinder test results.
41. **Quality of concrete work. Concrete testing.**
Concrete is to be free of hollows and humps. Finish floor areas are to be no more than 1/8" in 10'. Review specs for slump requirements. Do not add water to concrete without approval of Geotechnical personnel.
42. **Materials Testing / Re-testing**
Retesting shall be the at the contractor's expense.
43. **Inspection before pouring concrete.**
Two (2) day notice is required before you pour footings. Architect must approve all concrete placement. Pictures are not acceptable. Prior to footing inspection, all footings will be cleaned of

loose soil, debris, and water. Steel is to be properly tied and supported.

44. **What is expected of masonry work, mortar additive.**
All masonry work shall be as stated in the specs. Full head and bed bull-nose outside corners. Joints are expected on both sides of the units. Pre-formed corner tees, durowall and flashing are required. Mortar mix shall be made with same proportions everyday throughout entire project, using appropriate measuring devices. For tooling of brick or block, refer to specs. No brick or block less than a half unit is allowed at any opening. Full head weeps at 32" on center. All substandard masonry will be removed. Cull blocks; do not lay chipped blocks. Cut holes for electrical outlet boxes the proper size; caulking and oversized plates are not allowed.
45. **Problems with hollow metal (install proper fire labels).**
Do not paint fire labels. Labels will be attached; rating is to be embossed in minutes and/or hours. Specs require coating the interior of the frames. Grout frames solid.
46. **Pre-roofing conference. No roofing materials installed prior to conference.**
Contractor, manufacturer and applicable suppliers are required to be present. Verify with DCM inspector if underlayment installation is acceptable prior to pre-roofing conference.
47. **G.C. is to have copies of all required roofing warranties in hand at the final inspection.** i.e. Manufacturers' and DCM Five Year warranty issued by the General Contractor and the Roofing Subcontractor, (which is to be dated the date of the substantial completion), or final cannot be held.
48. **Potential conflict of mechanical and electrical equipment.**
It is the responsibility of the GC to coordinate the installation of all equipment where a conflict may occur. G.C., HVAC, Plumbing and Electrical subs are to read their sections of specs. Each foreman is to sign their section on the master copy, which is kept in the job trailer.
49. **Problems with fire damper installations.**
Installation of the dampers will be as shown on the plans. All other installation procedures will be unacceptable.
A. Fire stop material; workmen must be certified to install firestop material. Firestop system must be a UL approved assembly. (See manufactures' manual).
B. Stencil all fire walls, both sides every 20ft.
50. **Certificate of Substantial Completion.**
Architect will provide at the final inspection, provided contractor has copies of all roof warranties and the fire alarm certification.
51. **Project Closeout Procedures / Final payment.**
A. Warranties must be effective the Date of Substantial Completion. All warranties must identify the product covered.
B. Operating and maintenance manuals. All training required for the MPE fields will be completed prior to the final request being released.
C. As-built drawings.
D. Other requirements. G.C. is to make a list of all over-stocks that are required by specs and have at final for B.O.E. signature and acceptance.
E. Final Payment. Punch list items must be completed to the Architect and DCM Inspector's satisfaction, all close out documents must be received by the Architect, all change orders must be fully executed and Certificate of Substantial Completion must be fully executed before final payment is made. (GCS, 34A & B, MP 7 G4)

52. **Advertisement of Completion. Start ad after substantial completion.**
A. 1 week for projects valued less than \$50,000.00.
B. 4 consecutive weeks for projects exceeding \$50,000.00.
C. General Contractor is responsible for placement and payment of advertisement.
53. **Time Extensions.**
The GC can submit time extension request to the Architect on a weekly basis, with reasons for extension. Delays caused by rain, must exceed the five year average. (GCS 23).
54. **Quality Control.**
Urinals 17" A.F.F. Flush valves at wide side. Rigid conduit under slab. Fire strobes 80" to bottom, within 15' of exits.
55. **Requests For Information (RFI'S)**
A. All RFI's must be numbered and made in writing to the Architect's email rfi@lathanassociates.com by the General Contractor. Please include your name, company name, telephone number, and fax number so that we may respond appropriately. Verbal RFI's will not be answered. All RFI's must be in writing.
B. The Architect will not accept RFI's directly from subcontractors or vendors.
C. The Team List provided within the Specification Manual is for informational purposes only and should not be used to contact Engineers and/or Consultants directly with questions regarding the project.
D. All questions that need to be directed to an Engineer / Consultant must be routed through the Architect's office. If applicable, the Architect will contact the appropriate Engineer / Consultant for information.
E. Bids shall be based upon the official Contract Documents consisting of Plans, Specifications and Addenda. Architect assumes no responsibility for information used by Contractors outside the official Contract Documents.
F. **A RFI Log shall be kept by the Contractor and reviewed at each OAC Meeting.**
It will be the contractor's responsibility to inform Architect of any outstanding RFI's in a timely manner.
56. **Liquidated Damages**
Liquidated damages will be strictly enforced for not reaching substantial completion by the scheduled completion date. Liquidated damages will be deducted from the General Contractors final payment.
57. **Miscellaneous:**

