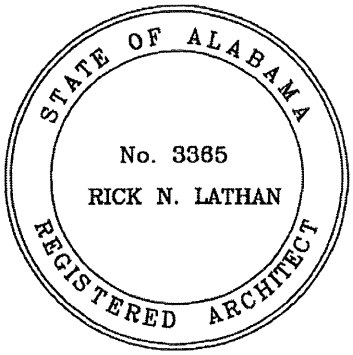

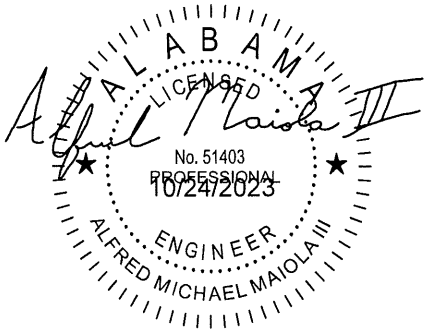

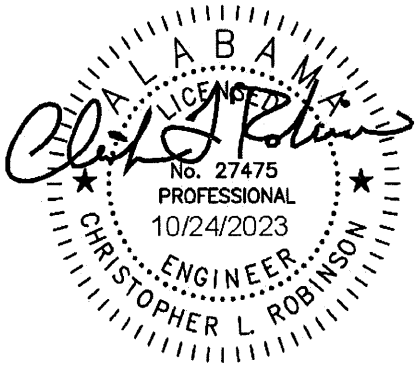

ARCHITECT'S JOB NO. 23-66

DATED: OCTOBER 24, 2023

BASEBALL AND SOFTBALL COMPLEX RENEWAL FOR GADSDEN STATE COMMUNITY COLLEGE

ACCS NO. 2023 063 GSCC

OWNER

ALABAMA COMMUNITY COLLEGE SYSTEM
P.O. BOX 302130
MONTGOMERY, AL 36130

ON BEHALF OF:

GADSDEN STATE COMMUNITY COLLEGE
1001 GEORGE WALLACE DRIVE
GADSDEN, AL 35903

DR. KATHY L. MURPHY - PRESIDENT

LATHAN ARCHITECTS

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BASEBALL AND SOFTBALL COMPLEX RENEWAL
FOR GADSDEN STATE COMMUNITY COLLEGE
Architect Job No. 23-66

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- Final Report of Special Inspections
- Agent's Final Report

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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
BASEBALL AND SOFTBALL COMPLEX RENEWAL
FOR GADSDEN STATE COMMUNITY COLLEGE
Architect Job No. 23-66

OWNER:	ALABAMA COMMUNITY COLLEGE SYSTEM P.O. Box 302130 Montgomery, AL 36130 GADSDEN STATE COMMUNITY COLLEGE P.O. Box 227 Gadsden, Alabama 35902
ARCHITECT:	LATHAN ASSOCIATES ARCHITECTS, P. C. 300 Chase Park South, Suite 200 Hoover, AL 35244 Contact: rfi@lathanassociates.com
LANDSCAPE:	HNP LANDSCAPE ARCHITECTURE 1914 28th Avenue South Birmingham, AL 35209
CIVIL:	LBYD, INC. 880 Montclair Road, Suite 600 Birmingham, AL 35213
STRUCTURAL:	STRUCTURAL DESIGN GROUP 300 Chase Park South, Suite 125 Hoover, AL 35244
MECHANICAL / PLUMBING:	DEWBERRY ENGINEERS, INC. Riverchase Office Plaza #2, Suite 205 Hoover, AL 35244
ELECTRICAL:	DEWBERRY ENGINEERS, INC. Riverchase Office Plaza #2, Suite 205 Hoover, AL 35244

LIST OF DRAWINGS
BASEBALL AND SOFTBALL COMPLEX RENEWAL
FOR GADSDEN STATE COMMUNITY COLLEGE
Architect Job No. 23-66

DRAWINGS INDEX (SET 73 TOTAL SHEETS)

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C3.0	GRADING & DRAINAGE PLAN
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A2.1	CONCESSIONS PLAN AND ELEVATIONS
A2.2	BASEBALL DUGOUTS PLANS, ELEVATIONS, AND DETAILS
A2.3	SOFTBALL DUGOUTS PLANS, ELEVATIONS, AND DETAILS
A2.4	BATTING CAGES PLANS AND ELEVATIONS
A2.5	BLEACHERS / PRESSBOXPLANS, ELEVATIONS AND DETAILS
A2.6	BASEBALL/SOFTBALLROOF PLANS AND DETAILS
A2.7	CONCESSIONS BUILDING SECTIONS, WALL SECTIONS AND DETAILS
A2.8	BASEBALL DUGOUTS BUILDING SECTIONS, WALL SECTIONS AND DETAILS
A2.9	SOFTBALL DUGOUTS BUILDING SECTIONS, WALL SECTIONS AND DETAILS

A2.10	BATTING CAGES AND BLEACHERS BUILDING SECTIONS AND DETAILS, DOOR AND WINDOW SCHEDULES AND DETAILS
A2.11	DOOR AN DWINDOW DETAILS
A2.12	WALL SECTIONS
A2.13	ROOF DETAILS
A5.1	ENLARGED TOILET PLANS, INTERIOR ELEVATIONS, LEGENDS, DETAILS AND NOTES
A5.2	INTERIOR DETAILS
A7.1	REFLECTED CEILING PLANS, LEGENDS, AND NOTES
A8.1	FINISH FLOOR PLANS

STRUCTURAL DRAWINGS (11 SHEETS)

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S1.1	GENERAL NOTES CONTINUED
S1.2	TYPICAL NOTES
S1.3	TYPICAL DETAILS
S2.1	CONCESSIONS FOUNDATION AND ROOF FRAMING PLAN
S2.2	BASEBALL HOME/VISITOR DUGOUT FOUNDATION AND ROOF FRAMING PLAN
S2.3	BASEBALL/SOFTBALL BATTING CAGES FOUNDATION AND ROOF FRAMING PLAN
S2.4	SOFTBALL HOME/VISITOR DUGOUT FOUNDATION AND ROOF FRAMING PLANS
S3.1	SECTIONS AND DETAILS
S3.2	SECTIONS AND DETAILS
S3.3	SECTIONS AND DETAILS

PLUMBING DRAWINGS (3 SHEETS)

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P1.1	PLUMBING – FLOOR PLANS
P2.1	PLUMBING – RISERS

MECHANICAL DRAWINGS (3 SHEETS)

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M1.1	MECHANCIAL – FLOOR PLANS

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E0.1	ELECTRICAL – LEGEND AND NOTES
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E0.5	ELECTRICAL – RISER DIAGRAM
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E3.1	ELECTRICAL – POWER FLOOR PLANS
E3.2	ELECTRICAL – POWER FLOOR PLANS
E4.1	ELECTRICAL – AUXILIARY FLOOR PLANS
E4.2	ELECTRICAL – AUXILIARY FLOOR PLANS

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 High School Athletic 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 athletic 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 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 athletic projects completed 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 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. Under this provision of equivalency, no consideration or award will be given to any General 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 meeting qualifying conditions. A list of all proposed subcontractors must be furnished within twenty-four (24) hours of the bid opening. Within forty-eight (48) hours of the bid opening, the General Contractor must submit the following documentation for Major Subcontractors:

1. Statement from Surety that Subcontractor is capable of bonding 100% of the materials and labor for this project's estimated discipline specific value. (Should the Owner require a Major Subcontractor to provide a bond after the bid, it will be handled by change order request.)

2. Must have a minimum of 5 years of experience doing business under the same name having predominately performed the discipline specific work being considered for this project. Joint ventures shall not be considered and will not be allowed for this project without specific approval from the Owner.

3. Must provide a list of all currently active projects; indicate: Owner, General Contractor, Architect / Engineer, dates, cost, brief description, schedule, etc.

4. Must provide a list of all projects of comparable characteristics & magnitude within the past 5 years in which equivalent discipline specific work was performed; indicate: Owner, General Contractor, Architect / Engineer, dates, cost, brief description, etc.

5. Must provide a statement from the Owner, Architect, Engineer or General Contractor of the most recent five projects verifying faithful performance that the work completion was, or will be, acceptably obtained without protracted delay and/or defects. Full explanation should be provided for any delayed completion.

6. Must submit the names, resumes / qualifications and duties of all key personnel or team members that will be involved with the work.

Major Subcontractors include: Site Work, Stadium Seating, Masonry, Mechanical, Plumbing, and Electrical.

The Owner and its representatives shall be the sole judge of the General 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.

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. rfi@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

CONTENTS

1. BID DOCUMENTS:

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

2. GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

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

3. QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

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

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

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

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

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

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

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

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

6. EXPLANATIONS and INTERPRETATIONS:

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

b. Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.
c. In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater

quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

7. SUBSTITUTIONS:

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

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

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

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

e. Procedures for "Pre-bid Approval". If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect's discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid

Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

8. PREPARATION and DELIVERY of BIDS:

a. ACCS Form 5-E: 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 ACCS Form 5-H: 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. ACCS Form 5-H: Accounting of Sales Tax

A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with ACCS Form 5-E: Proposal Form. Submission of ACCS Form 5-H 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.

. 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.

a. 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

FACILITIES MANAGEMENT

ACCS FORM 5-E

PROPOSAL FORM

To: Alabama Community College System Date: _____

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

_____

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

WORK:

Baseball and Softball Complex Renewal for Gadsden State Community College, Architect's Job No. 23-66

in accordance with Drawings and Specifications, dated October 24, 2023, prepared by:

Lathan Associates Architects , PC , Architect/Engineer

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

having its principal office 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 ofcers:

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 Specifi tions (including all Addenda received) for the Work and the other Bid and Contract Documents relative thereto, and that it has satisfi itself relative to the Work to be performed.

ADDENDA: The Bidder acknowledges receipt of Addenda Nos._____through_____inclusively.

BASE BID: For construction complete as shown and specifi the sum of:

_____Dollars ($)

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

For Alternate No. 1 (Remote Parking Lot) ◯ add ◯ deduct $

For Alternate No. 2 (Batter's Eye) ◯ add ◯ deduct $

For Alternate No. 3 (Champion Wall) ◯ add ◯ deduct $

UNIT PRICES – See Attachment.

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

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

◯ Bid Bond, executed by _____ as Surety,

◯ A cashier's check on the _____ Bank: _____,

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

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

Legal Name of Bidder: _____

Mailing Address: _____

***By (Legal Signature):** _____

*Name & Title (Print):

Telephone Number:

Email Address:

(SEAL)

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

PROPOSAL FORM ATTACHMENT

UNIT PRICES

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

EARTH EXCAVATION	General	$_____/per cu.yd.
	In Trenches	$_____/per cu. yd.
EARTH FILL	General	$_____/per cu. yd.
UNDERCUTTING OF UNSUITABLE SOILS		$_____/per cu. yd.
REPLACEMENT OF UNSUITABLE SOILS WITH ENGINEERED FILL		$_____/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. Unit pricing for undercutting and replacement of unsuitable soils shall be used for addition or deletion from the quantity allowances listed in specification section 02300. Onsite Geotechnical engineer shall determine if unsuitable soils are present.

Refer to SECTION 02300 - EARTHWORK for additional information.

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)

ACCS Form 5-H
(must be submitted with ACCS Form 5-E)
August 2021

ACCOUNTING OF SALES TAX

Attachment to ACCS Form 5-E: Proposal Form

Proposal Form

To: Alabama Community College Date: _____
(Awarding Authority)

NAME OF PROJECT: Baseball and Softball Complex Renewal for Gadsden State Community College

SALES TAX ACCOUNTING

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

	Description			ESTIMATED SALES TAX AMOUNT
BASE BID:				$ _____
Alternate No. 1	(Remote Parking Lot)	(add)	(deduct)	$ _____
Alternate No. 2	(Batter's Eye)	(add)	(deduct)	$ _____
Alternate No. 3	(Champion Wall)	(add)	(deduct)	$ _____

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

Legal Name of Bidder _____

Mailing Address _____

* By (Legal Signature) _____

* Name (type or print) _____

* Title _____ *(Seal)*

Telephone Number _____

Email Address _____

Note: A completed ACCS Form 5-H: Accounting of Sales Tax must be submitted with ACCS Form 5-E: Proposal Form. Submission of ACCS Form 5-H with ACCS Form 5-E is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

FACILITIES MANAGEMENT

ACCS FORM 5-F

BID BOND

• *Do not staple this form; use clips.*
The **PRINCIPAL** (Bidder's Company Name and Address) Name: Address:
The **SURETY** (Company Name and Primary Place of Business) Name: Address:
The **OWNER** Name: Alabama Community College System Address: 135 S. Union Street, Montgomery, AL 36130
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- day of -Month- -Year-

PRINCIPAL: _____ **ATTEST:**

BY: _____ _____

NAME AND TITLE

SURETY: _____ **ATTEST:**

BY: _____ _____

NAME AND TITLE

FACILITIES DIVISION

ACCS FORM 2-A

CONSTRUCTION CONTRACT

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

1 **ACCS PROJECT#:**	

2 This Construction Contract is entered into this **<day>** day of **<month>** in the year of **<year>**
3 between the **OWNER**, the Alabama Community College System on behalf of:

<Select Client>

Address:			
Email:		Phone:	

4 and the **CONTRACTOR,**

Company Name:			
Address:			
Email:		Phone:	

5 for the **WORK** of the Project identified as:

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

8 The **ARCHITECT** is

Firm Name:			
Address:			
Email:		Phone:	

9 The **CONTRACT SUM** is:

Dollars $

and is the sum of the Contractor's Base Bid for the Work and the following

10 **BID ALTERNATE PRICES**:

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

THE OWNER AND THE CONTRACTOR AGREE AS FOLLOWS: The Contract Documents, as defined in the General Conditions of the Contract (ACCS Form 2-B), 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 Chief Facilities Officer, ACCS Facilities Division, 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:** (Special Provisions may be inserted here, such as acceptance or rejection of unit prices. If Special Provisions are continued in an attachment, identify the attachment below).

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

License No.:			
Bid Limit:		Classifications	

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 No. 26.

15 APPROVALS	CONTRACTING PARTIES
ALABAMA COMMUNITY COLLEGE SYSTEM (ACCS) BY: _____ DATE: _____ CHIEF FACILITIES OFFICER	_____ CONTRACTOR COMPANY BY: _____ SIGNATURE NAME: _____ TITLE: _____
LOCAL COLLEGE OR TRADE SCHOOL BY: _____ AS PRESIDENT OF **<Select Client>**	**ALABAMA COMMUNITY COLLEGE SYSTEM** (AS OWNER) BY: _____ CHANCELLOR

ATTACHMENTS:

- ☐ Proposal Form **(ACCS Form 5-E)**
- ☐ Accounting of Sales Tax **(ACCS Form 5-H)**
- ☐ Bid Tabulation
- ☐ Certificate of Liability Insurance
- ☐ Payment Bond **(ACCS Form 2-D)**
- ☐ Performance Bond **(ACCS Form 2-C)**
- ☐ State of Alabama Disclosure Statement
- ☐ E-Verify Memorandum of Understanding

FACILITIES MANAGEMENT

ACCS FORM 2-C

PERFORMANCE BOND

7 **SURETY'S BOND NUMBER:**	
1 The **PRINCIPAL** (Company name and address of Contractor as appears in the Construction Contract)	
NAME:	
Address:	
2 The **SURETY** (Company name and primary place of business)	
NAME:	
Address:	
3 The **OWNER:** THE ALABAMA COMMUNITY COLLEGE SYSTEM ON BEHALF OF:	
Address:	
4 The **PENAL SUM** of this Bond (the Contract Sum):	
5 **DATE** of the Construction Contract:	
6 The **PROJECT:** (Same as appears in the Construction Contract)	

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 -Month- -Year-

9 **SURETY:**

_____
SURETY COMPANY NAME

BY: _____
SIGNEE'S PRINTED NAME

TITLE: _____
SIGNEE'S TITLE

10 **CONTRACTOR** as **PRINCIPAL:**

_____
CONTRACTOR COMPANY NAME

BY: _____
SIGNEE'S PRINTED NAME

TITLE: _____
SIGNEE'S TITLE

11 **NOTE:** Original power of attorney for the Surety's signatory shall be furnished with the original bond form to be attached to each of the contract forms per project.

FACILITIES MANAGEMENT

ACCS FORM 2-D

PAYMENT BOND

7 **SURETY'S BOND NUMBER:**	
1 The **PRINCIPAL** (Company name and address of Contractor as appears in the Construction Contract)	
NAME:	
Address:	
2 The **SURETY** (Company name and primary place of business)	
NAME:	
Address:	
3 The **OWNER:** THE ALABAMA COMMUNITY COLLEGE SYSTEM ON BEHALF OF:	
Address:	
4 The **PENAL SUM** of this Bond (the Contract Sum):	
5 **DATE** of the Construction Contract:	
6 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.

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 -Month- -Year-

9 **SURETY:**	10 **CONTRACTOR** as **PRINCIPAL:**
_____ SURETY COMPANY NAME	_____ CONTRACTOR COMPANY NAME
BY: _____ SIGNEE'S PRINTED NAME	**BY:** _____ SIGNEE'S PRINTED NAME
TITLE: _____ SIGNEE'S TITLE	**TITLE:** _____ SIGNEE'S TITLE

11 **NOTE:** Original power of attorney for the Surety's signatory shall be furnished with the original bond form to be attached to each of the contract forms per project.

State of Alabama

Disclosure Statement

(Required by Act 2001-955)

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

OVER

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.

ACCS Project No._____

Application No._____

Date:

APPLICATION and CERTIFICATE for PAYMENT

Attach Schedule of Values

TO OWNER, ALABAMA COMMUNITY COLLEGE SYSTEM Address:	PROJECT:
FROM CONTRACTOR: Company Name: Address:	ARCHITECT/ENGINEER: Firm Name: Address:

Total Original Contract	$
Fully Executed Change Order(s) Numbers ___ through	$
___ Total Contract To Date	$

1.	Work Completed to Date per attached Schedule of Values	$
2.	Stored Materials	$
3.	Total Completed Work and Stored Materials (____% *of Contract To Date*)	$
4.	Less Retainage *(5% of Total Completed Work & Stored Materials [TCWSM] is retained when TCWSM is less than 50% of Total Contract To Date [TCTD]. 0 is retained on final pay. app.)*	($)
5.	Total Due	$
6.	Less Total Previous Payments	($)
7.	Balance Due This Estimate	$

CONTRACTOR'S CERTIFICATION

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

By: Date:
Contractor's Signature

Name & Title

Sworn and subscribed before me this _____ day of_____
Seal: Day 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

- Date of first payment application cannot precede the Notice to Proceed's Begin Date.
- A change order must be fully executed before inclusion on a payment application.
- On a final payment application, all change orders must be fully executed and included.
- Contractor's signature date cannot precede the payment application date.
- Progress schedules must be included with non-final payment applications.
- One payment application per month may be submitted.
- Retainage is released when the Certificate of Substantial Completion is fully executed, all other close-out requirements per General Conditions Article 34 are completed and the final payment application is reviewed, approved and processed.

APPROVAL

_____
Owner

By

Name & Title

Date

SCHEDULE OF VALUES

ACCS Form 6-E

Project:

ACCS Project No.:

Contractor Company:

Application No.:

Retainage: *5% of Completed Work and Stored Materials to Date (G) is retained when G Total is less than 50% of Scheduled Value (C) Total. 0 is retained on final payment application.*

Application Date:

Period From: Period To:

A	B	C	D	E	F	G		H	I
Item No.	Description of Work	Scheduled Value (including fully executed change orders)	Work Completed: From Previous Application (D+E)	Work Completed: This Period	Materials Presently Stored (Not in D or E)	Completed Work & Stored Materials to Date (D+E+F)	% of Contract to Date (G/C)	Balance to Finish (C-G)	Retainage (Variable Rate)
1.						$ -			$ -
2.						$ -			$ -
3.						$ -			$ -
4.						$ -			$ -
5.						$ -			$ -
6.						$ -			$ -
7.						$ -			$ -
8.						$ -			$ -
9.						$ -			$ -
10.						$ -			$ -
11.						$ -			$ -
12.						$ -			$ -
13.						$ -			$ -
14.						$ -			$ -
15.						$ -			$ -
16.						$ -			$ -
17.						$ -			$ -
18.						$ -			$ -
19.						$ -			$ -
20.						$ -			$ -
21.						$ -			$ -
22.						$ -			$ -
23.						$ -			$ -
24.						$ -			$ -
25.						$ -			$ -
26.						$ -			$ -
27.						$ -			$ -
28.						$ -			$ -
29.						$ -			$ -
30.						$ -			$ -
	TOTALS:	$ -	$ -	$ -	$ -	$ -		$ -	$ -

INVENTORY OF STORED MATERIALS

Project:	ACCS Project No.:
Contractor:	For Estimate No.:
	For Period Ending:

A	B	C	D	E	F
DESCRIPTION	MATERIALS STORED LAST PERIOD	PURCHASED THIS PERIOD	TOTAL COLUMNS B + C	MATERIALS USED THIS PERIOD	MATERIALS PRESENTLY STORED

To be used as documentation to support value of Stored Materials reported on APPLICATION AND CERTIFICATE FOR PAYMENT.

SAMPLE PROGRESS SCHEDULE & REPORT	CONTRACTOR (Contractor may use own form):	DATE OF REPORT:
ACCS Project No.:		PROCEED DATE:
PROJECT:	ARCHITECT/ENGINEER:	PROJECTED COMPLETION DATE:

	WORK DIVISION	%	AMOUNT													
1.	GENERAL REQUIREMENTS															
2.	SITEWORK															
3.	CONCRETE															
4.	MASONRY															
5.	METALS															
6.	WOOD AND PLASTIC															100%
7.	THERMAL AND MOISTURE PROTECTION															90%
8.	DOORS AND WINDOWS															80%
9.	FINISHES															70%
10.	SPECIALTIES															60%
11.	EQUIPMENT															50%
12.	FURNISHINGS															40%
13.	SPECIAL CONSTRUCTION															30%
14.	CONVEYING SYSTEMS															20%
15.	MECHANICAL															10%
16.	ELECTRICAL															0%
TOTAL ORIG. CONTRACT		100%														
ANTICIPATED DRAW IN $1,000																
ACTUAL DRAW IN $1,000																

LEGEND: ANTICIPATED ACTIVITY — ACTUAL ACTIVITY — ANTICIPATED CASH FLOW — ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS SCHEDULED OVER 12 MONTHS.

FACILITIES MANAGEMENT

ACCS FORM 2-F

CONTRACT CHANGE ORDER

ACCS PROJECT#:	
CHANGE ORDER#:	
DATE:	

PROJECT:

TO:

Address:	

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.)

ACCS FORM 2-F

ORIGINAL CONTRACT SUM	**$**
NET TOTAL OF PREVIOUS CHANGE ORDERS	**$ 0**
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:

<Select Client>

The **OWNER** does hereby certify that this **CHANGE ORDER** was executed per the provisions of Title 39, Code of Alabama, 1975, as amended.

RECOMMENDED BY

_____
ARCHITECTURAL/ENGINEERING FIRM

NAME: _____

TITLE: _____

APPROVALS

_____
COMMUNITY COLLEGE PRESIDENT

BY: _____
SIGNATURE OF OFFICER

NAME: _____

TITLE: _____

ALABAMA COMMUNITY COLLEGE SYSTEM (ACCS)

BY: _____ DATE: _____
CHIEF FACILITIES OFFICER

CONTRACTING PARTIES

_____
CONTRACTOR COMPANY

BY: _____

NAME: _____

TITLE: _____

ALABAMA COMMUNITY COLLEGE SYSTEM
(AS OWNER)

BY: _____
CHANCELLOR

CONSENT OF SURETY

_____
SURETY COMPANY

BY: _____
(ATTACH CURRENT POWER OF ATTORNEY)

FACILITIES MANAGEMENT

ACCS FORM 2-G

CHANGE ORDER JUSTIFICATION

CHANGE ORDER #	
ACCS PROJECT #	
DATE:	

•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:		◯ ADD ◯ DEDUCT	TIME EXTENSION: CALENDAR DAYS
C ORIGINAL CONTRACT AMOUNT:			PREVIOUS C.O.'S THRU
CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER:			

D JUSTIFICATION FOR NEED OF CHANGE(S):

E JUSTIFICATION OF CHANGE ORDER vs. COMPETITIVE BID:

F ARCHITECT/ENGINEER'S EVALUATION OF PROPOSED COST:

G CHANGER ORDER RECOMMENDED	CHANGE ORDER JUSTIFIED AND APPROVED
_____ ARCHITECTURAL/ENGINEERING FIRM NAME BY: _____ ARCHITECT/ENGINEER'S SIGNATURE BY: _____ OWNER'S PROJECT REPRESENTATIVE SIGNATURE	BY: _____ OWNER'S SIGNATURE BY: _____ OWNER'S LEGAL COUNSEL'S SIGNATURE

CHANGE ORDER JUSTIFICATION: PURPOSE and INSTRUCTIONS

The **CHANGE ORDER JUSTIFICATION** is to be prepared by the design professional, who has evaluated the fairness and reasonableness of the proposed cost of the change(s) and recommends that the proposed Change Order be executed. The fully executed Form **CHANGE ORDER JUSTIFICATION** must accompany the proposed Change Order. Instructions for completing the Change Order Justification form are:

1. Insert the proposed Change Order Number, date of the Justification, and ACCS Project Number in the spaces provided in the upper right-hand corner.

2. Section (A): Insert the complete name and address of the PROJECT, OWNER(S), CONTRACTOR, AND ARCHITECT/ENGINEER.

3. Section (B): Provide a complete description of the proposed changes in work, referring to and attaching revised specifications and/or drawings as appropriate. An attachment may be used if additional space is needed, but insert the proposed amount and time extension of the change(s) in the spaces provided. **Attached a copy of the contractor's detailed cost proposal.**

4. Section (C): Insert the Original Contract amount, the net increase or decrease of previous Change Orders, and the Current Contract amount (preceding the currently proposed Change Order).

5. Section (D): Explain why it is necessary, or in the public's interest, to make the proposed change(s) to the Work.

6. Section (E): Explain why award of the changed work to the existing contractor instead of awarding the work under the competitive bid process is justified.

7. Section (F): The design professional must state his or her evaluation of the reasonableness and fairness of the proposed costs based upon his or her review of the contractor's proposal.

8. Section (G): The design professional must recommend the Change Order to the Owner by signing the document; the Owner may require such recommendation from other individuals.

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

GENERAL CONTRACTOR'S ROOFING GUARANTEE

ACCS Project No.

Project Name & Address	Project Owner, Alabama Community College System

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: _____ (Date of Substantial Completion) Period: Five (5) Years	

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

CERTIFICATE OF SUBSTANTIAL COMPLETION

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

TO:

ACCS FACILITIES DIVISION
135 S. Union Street
Montgomery, AL 36130
(334) 293-4500

ACCS Project 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 <u>one</u> (1) originally executed substantial completion form shall be routed for signature. ACCS Facilities Management 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'S DESIGNATED REPRESENTATIVE: _____	DATE:
	DATE:
APPROVALS:	
AHJ INSPECTOR (if applicable):	DATE:
	DATE:
ACCS FACILITIES MANAGEMENT DIRECTOR:	DATE:

ACCS Project Number: _____

Date of the Construction Contract:_____

_____

Contractor's Affidavit of Payment of Debts and Claims

Alabama Community College System	**Project** (*Same as appears in the Construction Contract*)**:**

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Consent of Surety to Final Payment. Whenever Surety is involved, a Consent of Surety form is required.

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.

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:

ACCS Number: _____

Date of the Construction Contract: _____

_____

Contractor's Affidavit of Release of Liens

To Owner, Alabama Community College System	**Project** (*Same as appears in the Construction Contract*)**:**

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Construction Contract referenced above.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.

Contractor (*Insert company name and address*)**:**

By:

Signature of authorized representative

Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____

Notary Public's Signature

My commission expires:

Seal:

_____

ACCS Number:_____

Date of the Construction Contract: _____

Surety's Bond Number: _____

CONSENT OF SURETY TO FINAL PAYMENT

To: **Owner, ALABAMA COMMUNITY COLLEGE SYSTEM**	Project (*Same as appears in the Construction Contract*):

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

Surety (*Insert name and address of Surety*)

on bond of

Contractor (*Insert name and address of Contractor*)

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to the Owner.

as set forth in said Surety's bond.

SIGNED AND SEALED this_____ day of , _____.

SURETY:

_____ Seal:

Company Name

By

Signature of Authorized Representative

_____

Printed Name and Title

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each original form.

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.

FACILITIES MANAGEMENT

ACCS FORM 2-B

GENERAL CONDITIONS *of the* CONTRACT

CONTENTS

Article 1
DEFINITIONS

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

A **ACCS FACILITIES DIVISION:** The ACCS Facilities Division, which is responsible for oversight and management of all ACCS construction projects, pursuant to the policies and procedures adopted by the ACCS Board of Trustees.

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 **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)

D **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.

E **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. 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.

F **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.

G **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.

H **CHIEF FACILITIES OFFICER:** The Director of the ACCS Facilities Division.

I **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.

J **NOTICE TO PROCEED:** A proceed order issued by the Owner, 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.

K **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.

L **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.

M **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.

N **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.

O **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.

P **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

Ⓐ 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.

Ⓑ 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.

Ⓒ 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.

Ⓓ 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.

Ⓔ INTERPRETATION

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

(2) Words or phrases used in the Contract Documents which have well-known technical or construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

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

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

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

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

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

Article 3
CONTRACTOR'S REPRESENTATION

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, one readable standard PDF set 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 &
(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* CONTRACTORS

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, AHJ or other reviewing entity, and their representatives.

Article 11
"AS-BUILT" DOCUMENTS

A Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets or one reapable standard PDF set 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 ACCS Form 6-H "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 the form "Progress Schedule and Report" referenced above.

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, AHJ, 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, AHJ, 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 an AHJ or other reviewing entity.

(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 AHJ where applicable, and are attended by the Contractor and applicable Subcontractors, suppliers and manufacturers. 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 AHJ or other reviewing entity 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, or other reviewing entity at the direction of the Owner, 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 ACCS Facilities Division, 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 LOCAL AHJ OR INDEPENDENT CODE CONSULTANTS

(1) The Local AHJ or Independent Code Consultant 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 Local AHJ or Independent Code Consultant shall have the authority to:

(a) reject Work that is not in compliance with the State Building Code, unless the Work is in accordance with the Contract Documents in which case the Architect shall initiate appropriate corrective action, and

(b) notify the Architect, Owner, and Contractor of Defective Work recognized by the Local AHJ or Independent Code Consultant.

(3) The Local AHJ or Independent Code Consultant'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 Local AHJ or Independent Code Consultants can be requested to schedule special inspections or meetings to address specific matters. The written findings of the Local AHJ or Independent Code Consultants will be transmitted to the Owner, Contractor, and Architect.

(4) The Local AHJ or Independent Code Consultant 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 Local AHJ or Independent Code Consultant 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* 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 completion of ACCS Form 2-F Contract Change Order and ACCS Form 2-G

Contract Change Order Justification forms. Only Change Orders 10% or greater of the current contract amount require the Owner's legal advisor's signature on the Change Order Justification form.

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, or public authority having jurisdiction or Independent Code Consultant, 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.

Ⓑ 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.

Ⓒ 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.

Ⓓ 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

Ⓐ **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 Chancellor, 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 Chancellor that the Claim be resolved by decision of a Professional, with Alabama licensing if the profession requires it, appointed by the Chancellor to review and determine the Claim. 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 Chief Facilities Officer. Upon receipt of a request to resolve a Claim, the Chief Facilities Officer 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.

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 *and* 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 ACCS Form 6-E, 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 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 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 Application and Certificate for Payment shall match to the penny and be accompanied by an attached 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) Application and Certificate for Payment shall be electronically submitted to ACCS Facilities Division for review following the Contractor's, Notary's, 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 when the Total Completed Work and Stored Materials is less than fifty percent of the Total Contract to date. Owner shall retain two and a half percent of the Total Contract to date after Total Completed Work and Stored Materials has reached fifty percent of the Total Contract to date. Retainage shall be released upon completion of all close-out requirements per Article 34 and the review, approval and processing of contractor's final Application for Payment.

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 AHJ, where applicable.

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 and Owner.

(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 and Owner,

(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 ACCS Form 6-K, Certificate of Substantial Completion, includes roofing work, the General Contractor's (5-year) Roofing Guarantee form 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. Failure to do so voids any Certificate of Substantial Completion. This requirement cannot be waived.

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. The Architect will prepare the Final Payment Checklist and forward 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 a Release of Claims 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.

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 AHJ if applicable, 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 AHJ or an Independent Code Consultant, where applicable. 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", ACCS Form 6-L 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.

(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 and Owner.

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

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

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

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

Article 37
CONTRACTOR'S *and* SUBCONTRACTORS' INSURANCE

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

A GENERAL

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

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

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

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

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

(5) MAXIMUM DEDUCTIBLE. Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $25,000.00.

(B) INSURANCE COVERAGES

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

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

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

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

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

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

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

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

Coverage Limit

.1 General Aggregate $2,000,000.00 per Project

.2 Products, Completed Operations Aggregate $2,000,000.00 per Project

.3 Personal and Advertising Injury $1,000,000.00 per Occurrence

.4 Each Occurrence $1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

.1 The policy shall name the Owner, Architect, ACCS, 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, ACCS, 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, ACCS, 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:

.1 Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or
.2 Partial or complete occupancy by Owner; or
.3 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), ACCS Form 2-C and 2-D, 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 six original P&P Bonds submitted with original signatures for each of the six 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 ACCS, 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
CONTRACTION *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 (including all AHJ fees) necessary for proper execution and completion of the Work which are customarily secured after award of the Construction Contract and which are in effect on the date of receipt of bids.

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

(B) TAXES

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

(C) COMPENSATION *for* INCREASES

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

(D) ALABAMA IMMIGRATION LAW

Per ACT 2011-535 as codified in Title 31, Chapter 13 of the Code of Alabama, 1975, as amended:
The contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.

(E) ALABAMA BOYCOTT LAW

Per Act 2016-312as codified in Title 41, Chapter 16, Article 1, of the Code of Alabama, 1975, as amended:
The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

(F) ACCOUNTING *of* SALES TAX EXEMPT PROJECTS

Per Act 2013-205 as codified in Title 40, Chapter 9, Article 1, of the Code of Alabama, 1975, as amended:
In bidding the work on a tax exempt project, the bid form shall provide an accounting for the tax savings.

Article 45
ROYALTIES, PATENTS, *and* COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, 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 project sign is not required for ACCS projects unless specifically indicated in the drawings or project manual.

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 Instructions to Bidders 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 – Remote Parking Lot:
Construction of the Remote Surface Parking Lot, Pedestrian bridge and Sidewalks as shown in the civil drawings.

Alternate No. 2 – Batter's Eye:
Provide and install 20'x40' Solid Surface Batter's Eye with flush Profile Wall Panels and Concealed Fasteners, Direct Embedment (BESF2040) By Sportsfield Specialties (888-975-3343, Brian Jaeger), or approved equal. Color To Be Determined. Include required concrete footing. (1) aligned with Center Line of Baseball. (1) aligned with Center Line of Softball. (2) Total Qty.

Alternate No. 3 – Champion Wall:
In lieu of chain link fence and slats, Provide and install a complete 8' Ht. Champion Wall system by SportsEdge (800-344-6057), or approved equal. Color To Be Determined. Include required concrete footing. Extents to include Left Field corner to Right Field corner at both Baseball and Softball. Provide gates as required.

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 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.

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

None at this Time.

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 Baseball and Softball Complex Renewal for Gadsden State Community College.

A. General Description

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, standing seam roof on metal deck system, pre-engineered structural metal frame, interior concrete block wall and paint finish, acoustical tile ceiling, hard tile floor and wall finishes, kitchen equipment, plus plumbing, mechanical and electrical work as required to perform the work under this Contract for Gadsden State Community College 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 October 24, 2023.

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 ACCS.

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 Contractor shall pay for utility usage bills.

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

The Instructions to Bidders, General Conditions, Modified General Conditions and Special Project Requirements as set forth herein are applicable to the work under every Division and Section of these Specifications.

TIME FOR COMPLETION

All work under this Contract shall be complete and ready for Owner occupancy /within Three Hundred and Sixty-Five (365) consecutive calendar days from written Notice To Proceed. The work under this contract shall commence within Ten (10) calendar days from date of Notice To Proceed.

TIME IS OF THE ESSENCE

The Owner must occupy the work within the completion time indicated herein. Delivery time for equipment and material provided under this contract shall include lead time for storage and ready installation within time limits of the work. Coordination of Owner furnished / Contractor installed equipment and/or materials shall be considered within time limits of the work.

BID GUARANTY

The base bid proposal shall be guaranteed for a period of Sixty (60) days after date of proposal. Alternate proposals (additive or deductive), if requested, shall be guaranteed for a period of Ninety (90) days after date of signing contract. Unit prices, if requested, shall be guaranteed until the date of final acceptance of the project by the Owner. Upon receipt of the drafted construction contract, the contractor shall have no more than fourteen (14) days to execute and return the construction contract to the architect with all supporting documentation in correct order.

INSURANCE

All projects require Builder's Risk Insurance

OWNER

All papers shall be delivered to the Owner, unless otherwise specified in writing to the Contractor. Wherever the term "Owner" is used in the Specification it shall refer to:

ALABAMA COMMUNITY COLLEGE SYSTEM
P.O. BOX 302130
MONTGOMERY, AL 36130

ON BEHALF OF:

GADSDEN STATE COMMUNITY COLLEGE
P.O. BOX 227
GADSDEN, AL 35902

ARCHITECT

Wherever the term "Architect" is used in the Specifications, it shall refer to:

LATHAN ASSOCIATES ARCHITECTS, P. C.
300 CHASE PARK SOUTH, SUITE 200
HOOVER, ALABAMA 35244

who by contract with the Owner, is authorized to prepare all drawings, details, and specifications for this work.

After the award of this contract, supervision of the work will be performed by the aforementioned Architect, his duly authorized representatives, or his duly appointed successor as may be designated in writing to the Contractor by the Owner.

APPLICABLE CODES AND AUTHORITIES

A. Codes

1. The work of this project shall be in accordance with the 2021 Edition, International Building Code. The minimum building standard code adopted by the Division of Construction Management is the 2021 International Building Code. The following companion codes to the 2021 International Code are also adopted:
   a. 2021 – International Existing Building Code.
   b. 2021 – International Plumbing Code.
   c. 2021 – International Fuel Gas Code.
   d. 2021 – International Mechanical Code.
   e. 2020 – National Electrical Code (NFPA 70).
   f. 2021 – International Fire Code.
   g. ANSI/ASHRAE/IES Standard 90.1 – 2013 Energy Standard for Buildings.
   h. 2010 – ADA Standards for Accessible Design.
   i. 2019 NFPA 72: National Fire Alarm and Signaling Code (NFPA 72).

2. The requirements of the 2010 ADA Standards for Accessible Design supersede the accessibility requirements contained in the International Building Code and ANSI A117.1.

3. Promptly notify the Architect, in writing, if any of the contract documents are in conflict or variance with applicable codes, laws and ordinances. All changes will be made by written addenda or modifications.

B. Precedence of Codes

1. In case of conflict between the State Building Code, local codes, the Life Safety Code enforced by the State Fire Marshal, or other codes, the most stringent requirements shall prevail.

2. All food preparation facilities, private water systems, and sewage disposal systems shall also meet the requirements of and be approved by the applicable county health department.

C. Authorities, including but not limited to:

1. Prevailing City or County Permitting/Inspection Department

2. Alabama Department of Environmental Management (ADEM)

3. US Army Corps of Engineers

4. Secure and pay for permits, impact fees, government fees and licenses. This will include, but not be limited to, all permits and/or fees required by ADEM, Local/State agencies.

C. If any work is performed knowing it to be contrary to such codes, law, ordinances, rules and regulations and without notice to the Architect, the Contractor assumes full responsibility therefore and shall bear all costs for compliance thereto.

FIRE ALARM REQUIREMENTS

The Certified Fire Alarm Act requires that every business who installs fire alarm systems in commercial occupancies 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 will 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 on fire

alarm work must show evidence at the pre-bid conference that he/she meets the certification requirements of the Act and holds a permit issued by the State Fire Marshal.

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

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

NONRESIDENT BIDDERS

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

PRE-BID CONFERENCE

A conference of intended bidders may be held by the Owner prior to the time for the opening of bids for the purpose of presenting and explaining the policies of the Board. Notification of date and place for conference shall be given by written addenda.

PRE-CONSTRUCTION CONFERENCE

A conference shall be held at the job site no later than two weeks following the date of "NOTICE TO PROCEED". The purpose of this conference is to define the duties and responsibilities of the Architect, Owner, Contractor, and Local Building Authority. All forms, procedures, schedules, and other pertinent requirements will be discussed.

PRE-ROOFING CONFERENCE

A pre-roofing conference is required before any roofing materials are installed. This conference shall be conducted by a representative of the Architect and attended by representatives of the Owner, General Contractor, Roofing Contractor, Local Inspector (If required) Sheet Metal Contractor, Roof Deck Manufacturer (if applicable), and the Roofing Materials Manufacturer. If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.

The pre-roofing conference is intended to clarify demolition (for renovation or re-roofing projects) and application requirements for work to be completed before roofing operations can begin. This would include a detailed review of the shop drawings, submittal data and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case, should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

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 isn't provided as required, the conference will be voided, an inspection fee will be issued, and it will have to be rescheduled.

The following are to be accomplished during the conference:

1. Review all Factory Mutual and Underwriters Laboratories requirements listed in the

specifications and resolve any questions or conflicts that may arise.

2. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
3. Establish roofing schedule and work methods that will prevent roof damage.
4. Require that all roof penetrations and walls be in place prior to installing the roof.
5. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
6. Establish weather and working temperature conditions to which all parties must agree.
7. Establish acceptable methods of protecting the finished roof if any trades must travel across or work on or above any areas of the finished roof.

The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project records and copies furnished to the General Contractor and the Owner.

Regardless of whether or not the sample warranty has been submitted to the Architect, a copy of the warranty must be provided by the Manufacturer at this Pre-Roofing Conference.

PRE-FINISHES CONFERENCE

If elected by the Architect, a conference shall be held at the job site within two weeks prior to the installation of finishes. All Contractors involved with finish work are required to attend. The purpose of this conference is to discuss finish work, coordination issues, the Owner's and Architect's expectations of quality and workmanship and the position of the Owner and Architect regarding poor quality and workmanship. This conference must be scheduled two weeks in advance of any finish installation.

LIST OF SUBCONTRACTORS AND PRINCIPAL MATERIAL SUPPLIERS

A copy shall be prepared by the successful Contractor and delivered to Architect within **Twenty-Four (24) hours after bid**. List shall show following information on each Subcontractor and/or Supplier:

A. Name of Subcontractor and/or Supplier
B. Complete mailing address
C. Telephone Number
D. Person to contact and position in organization
E. Scope of Work to be performed by Subcontractor and percent of total contract.
F. For work involving fire alarm systems, General Contractor's must submit a copy of the Fire Alarm contractor's State Fire Marshall's Fire Alarm Permit at the same time as submission of the subcontractor and supplier list to Architect. The architect or engineer shall reject fire alarm contractors who cannot provide a copy of the required permit.

This list may also be emailed to submittals@lathanassociates.com.

PROGRESS SCHEDULES AND CHARTS

One hard copy prepared by Contractor and delivered to Architect at beginning of job. Five (5) additional copies must be submitted with each monthly request for payment showing actual progress. The schedule shall be in the form of an Analog Bar Chart Schedule of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The Contractor shall enter on the Chart his actual progress, preferably at the end of each week, but in any event, at the end of each month, and deliver to the Architect five (5) copies thereof and attach one to his monthly Application for Partial Payment.

CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 30 days of the date established for "Commencement of the Work".

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the "Schedule of Values".

2. Within each time bar indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.

3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicated graphically sequences necessary for completion of related portions of the work.

5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Work Stages
Indicate important stages of construction for each major portion of the work, including testing and installation.

C. Cost Correlation
At the head of the schedule, provide a two-item cost correlation line, indicating "precalculated" and "actual" costs. On the line show dollar-volume of work performed as of the dates used for preparation of payment requests.

D. Distribution
Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.

E. Schedule Updating and Progress Photographs
Revise the schedule after each bi-weekly meeting or activity, where revisions have been recognized or made. Issue the copies of updated schedule concurrently with progress photographs and report of each meeting to the Owner and Architect.

NOTICE OF SALES AND USE TAX EXEMPTION

The Owner is a tax-exempt agency. Materials incorporated into the Work are exempt from sales and use tax, therefore Contractor shall NOT include sales and use taxes in his Bid. Pursuant to Alabama Act No. 2013-205 (effective 5/9/2013), Contractors bidding the Work shall be required to attach "Accounting of Sales Tax" (ACCS) Form) to their Bid. **FAILURE OF THE CONTRACTOR TO COMPLETE THIS ATTACHMENT TO BID PROPOSAL FORM INDICATING THE SALES TAX AS REQUIRED SHALL RENDER THE BID NON-RESPONSIVE**.

It shall be the responsibility of the successful Contractor and any Subcontractor working under the same contract to apply for a Certificate of Exemption from the Alabama Department of Revenue for this specific project and to comply with all ADOR rules and regulations. The Owner shall not consider claims for additional costs resultant of the Contractor's or its subcontractors' failure to comply with such rules and regulations.

However, the Owner may elect to issue Form ST: PAA1 Purchasing Agent Appointment which appoints the Contractor as Agent to purchase materials Tax-Exempt. In this case, invoices must be transmitted for direct payment by the Owner.

DAMAGE TO PROPERTY

A. The Contractor shall be solely responsible for all work of this contract prior to such work achieving official Substantial Completion of the General Conditions of the Contract; and for providing adequate insurance, including: project specific Builder's Risk Insurance and Flood Insurance to cover the following:
   1. Any damage to or loss of stored materials.
   2. Any damage to or loss of in-place work.
   3. Any damage to or loss of any portion of on-site or off-site property, existing or new, resulting from failure of or omission of protective measures; or caused by the work of this contract, including but not limited to: property, furnishings, contents or loss of revenue.

   The Contractor shall be further responsible for promptly correcting or remedying of any such damage or loss; and shall exercise all reasonable measures to minimize any resulting delays to the project's original completion schedule.

B. Damaged work shall be considered Defective Work.

PERMIT FEE
ACCS Form C-8, "General Conditions of the Construction Contract", states the following:

> "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 all 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."

For public works projects falling under The State of Alabama Department of Finance - Division of Construction Management's jurisdiction and bid after October 1, 2014, the Architect shall include a copy of The State of Alabama Department of Finance - Division of Construction Management user fee schedule in the project manual and specify that the permit fee is to be included in the contractor's bid and paid by the Contractor.

The Pre-Construction Conference cannot be held until both (1) the permit fee and (2) the signed construction contract has been executed.

INSPECTIONS
Scheduling - The contractor will contact the architect by e-mail at inspections@lathanassociates.com of the date the project will be ready for an inspection.

- The Architect will contact Inspector to schedule the first available date for the inspection. Inspections must be requested minimum 14 days in advance.

- When the 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

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 to the General Contractor.

- If an inspection is held and the project is not deemed ready for inspection or it does not pass the inspection, a re-inspection fee of $1,500 will be charged to the General Contractor.

- Contractor shall coordinate the inspections required by the local AHJ/ Independent Code Consultant as necessary. As a minimum requirement, the General Contractor shall provide a minimum one-weeks' notice to the Owner and the Design Professional (or more where required by the local AHJ or Independent Code Consultant) for stages of progress sufficient to hold the following inspections:

    - In-Ground Inspection:

    - Substantial Completion Inspection: The work is "Substantially Complete", all life safety features are operational and approved, and the Contractor has prepared a detailed Punch List of remaining touch-up work to the Owner and the Design Professional.

    - Final Inspection: The work is complete, and the Owner may make use of the project. The Final Inspection shall be attended by the Owner's representative(s) and the Design Professional

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, Inspector

    - Inspection Requirements:
        - Signed construction contract
        - 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, Inspector

    - 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 Inspector

    - Inspection Requirements:
        - All work must be completed except for install at ion of ceiling tiles and/or hard ceilings
        - Space must be conditioned
        - Permanent power must be connected unless otherwise arranged with the Inspector
        - Grease duct must be inspected and approved by the 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, Inspector

    - Inspection Requirements:
        - Fire alarm certification
        - Kitchen hood fire suppression system certification
        - Provide Smoke Machine for testing of Duct Detectors
        - General Contractor's 5-Year Roofing Warranty (Form C-9)
        - Roofing manufacturer's guaranty
        - Emergency and exit lighting tests
        - Fire alarm must be monitored
        - 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, Inspector and /or Major subcontractors may also be required to attend

    - Inspection Requirements:
        - Owner 's list of documented warranty items

MATERIALS
ALL MATERIALS FOR THIS PROJECT SHALL BE ASBESTOS FREE.

PROTECTION OF WORK AND PROPERTY
Contractor shall confine his operations to the project work limits of this contract and shall maintain required exit and fire safety requirements as well as Owner's security requirements. Protect adjoining spaces and cause no damage to same; any damage to be immediately repaired.

A. Protection of Work and the Public
Provide adequate protection, in full accordance with local, State and Federal regulations, for the work in progress as well as for the public and others using the site, until the completion of all work.
Provide suitable signs, signals and barricades against trespassing by individual and take whatever steps necessary or required by law to protect workers and public from harm. Protect the work and the public from damage of any kind during all operations. Methods described herein are minimum standards acceptable except where exceeded by Federal, State or local requirements.

B. Safety and Traffic Control Devices During Construction

1. Within the limits of area designated for work under this contract, and any staging or traffic areas, this Contractor shall furnish, install, and maintain all safety and traffic control devices during the construction period as described herein, and as required by law.

2. All safety and traffic control devices shall be in compliance with Federal, State and local laws and regulations, and to the requirements and approval of applicable local officials, State Highway Department and the Architect.

3. Wherever the work affects the normal flow of vehicular or pedestrian traffic, traffic control devices shall be in accordance with requirements and standards as set forth in the "Manual on the Uniform Traffic Control Devices for Streets and Highways", latest edition, as published by U.S. Department of Transportation, Federal Highway

Administration, and Section "G" of the Alabama Manual on Uniform Traffic Control Devices, Volumes I and II, latest edition.

4. Traffic Control Devices. Traffic control devices shall be installed at the inception of the construction operations and shall be properly maintained during the periods of construction. They shall remain in place only as long as they are needed and shall be removed immediately thereafter.

5. All traffic control devices must be approved by the City, County and by all affected enforcing agencies.

6. Protective Construction Site Barricade
   a. Requirements: Contractor shall furnish, install and maintain throughout the life of the Contract, all necessary barricades, covers, scaffold guards, warning signs, warning lights, channelization markers and other protective devices, all as required by Owner, local rules, regulations and ordinances, and as necessary to protect the work from trespassing.

   b. Barricades, enclosing devices and warning lights may be standard rental items of equipment in compliance with these requirements; and shall be of a type that affords security, is quite visible and is easily moved.

   c. Materials for use in construction of site barricades and other protective devices shall be of new exterior plywood and not less than #2 pine structural lumber, all of good appearance, sound, square, straight, in line, braced and well-constructed. All materials, except those to be walked on, shall be painted.

   d. Move barricades from one area to the next as the work progresses. Remove all upon completion.

   e. Lighting on Barricades: Furnish and install traffic warning lights or barricades, in areas of vehicular traffic. Install yellow traffic signal lamps complete with all wiring, switches, disconnects, fusing, sockets, guards and hanging provisions. These lights shall be turned on during all hours of darkness (dusk to dawn). Maintain in service during the construction period; move forward as site of work moves. Remove all upon completion of work.

   f. See also erosion control requirements of Earthwork Section 02300.

   g. **Unauthorized visitors not permitted within working and storage areas.** OSHA approved suitable personal safety devices are to be provided for authorized visitors within working areas. Suitable fire extinguishing equipment, readily accessible from any part of the work, to be provided and maintained. Erect any and all required additional protective barriers, lights, etc., as necessary for safety and protection. Keep area of work closed off when not in use.

C. Utilities
1. See Section 01025 for utility usage bills responsibility.

2. Other utility bills caused by work of the contract are to be paid by Contractor as outlined in the SUMMARY OF THE WORK. Contractor to provide own telephone, temporary heat and pay costs for same. Contractor to pay for any sewer impact fee as related to this project. All project related sanitary conditions are the responsibility of the Contractor.

3. Contractor must investigate and verify the existence and location of all site utilities in the field before starting work. Flag on site all underground service lines in the construction area. Notify the Architect of any condition which, in the Contractor's opinion, may interfere with the completion of work as designated. Excavating in the vicinity of existing utilities shall be done carefully and by hand. Maintain and protect existing utilities.

4. The Contractor is responsible for all temporary utility connections to utilities.

D. Protection of Materials
Properly and effectively protect all materials and equipment, before, during and after their installation. Contractor will be allowed to store materials, equipment, etc., on the site. Security of the area(s) will be the sole responsibility of the Contractor. **Protect materials such as insulation and insulated duct from rain exposure.**

E. Watchman
The Contractor, at his own expense and option, may employ a watchman at such time as he deems necessary to protect his work and/or materials.

DAMAGE TO PROPERTY
The contractor will be responsible for, and insure against, any damage to property, furnishings, and/or loss of revenue resulting from any damage to any part of the existing property caused by the work of this Contract.

SPECIAL SAFETY REQUIREMENTS
All exitways shall be maintained free and clear of all stored materials, debris, etc.

No combustible construction materials shall be stored in the Project area after the day's work is complete. Remove any potentially hazardous materials immediately to prevent any fire hazards which may result from the construction of this Project. In addition, precautions shall be made by the General Contractor to prevent any other activities at the site which may constitute a fire hazard.

In addition to any portable fire extinguishers existing in the building, the General Contractor shall provide additional fire extinguishers during the construction as required.

Refer to the General Conditions for additional safety requirements.

USE OF PREMISES, SANITARY PROVISIONS
Refer to SECTION 01035, SPECIAL PROJECT PROCEDURES, for use of premises, sanitary provisions which are specifically related to this project. Note that sanitary conditions are the responsibility of the Contractor.

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 or evacuation requirements may also be in place and is the responsibility of the General Contractor to abide by all school rules.

USE OF OCCUPIED PREMISES
During execution of this Contract, clear passages must be maintained as described along corridors. Owner will endeavor to keep personnel and visitors from work areas, but it will be the Contractor's responsibility to enforce all safety precautions.

CUTTING AND PATCHING
All excavation and cutting of new work to accomplish the work shall be by the respective trades. It is to be noted that Divisions 15 and 16 each are required to perform the necessary cutting of floors, walls, ceilings as necessary to install the work of their trade, all under the direct supervision of the General Contractor and in accordance with the construction schedule. The General Contractor is responsible for the repair, replacement

and finish of pavement, roofs, floors, walls and ceiling (all finish work); and same shall be accomplished by competent workmen and finish up in a neat manner, by craftsmen skilled in their work, all to be equal in quality and appearance of adjacent work. Finished installation shall comply with specified tolerances and finishes. The Contractor shall not cut, excavate, or otherwise alter any work in a manner or by a method or methods that will endanger the work, adjacent property, workmen, the public or the work of any other Contractor.

In acceptance or rejection of the work of the Sections involved in the application of finish materials, the Architect will make no allowance for lack of skill on the part of the workmen.

When necessary to cut, or alter completed work to accommodate subsequent work, the Contractor performing the work previously in place shall do such cutting and repairing.

Cost of cutting and repairs necessitated by fault of negligence, or for other reasons, shall be borne by the Contractor at fault in requiring such work.

If a Contractor or Subcontractor fails to do necessary cutting or fails to have restored any work of others damaged by him, for a period of time causing delay in project construction, the Owner may do so and cost thereof shall be charged to the General Contractor.

Cutting of structural members will not be permitted.

FIRE INTEGRITY OF CONSTRUCTION shall be maintained whenever components of rated assemblies are penetrated, jointed, cracked or compromised in any way either intentionally or unintentionally; including, but not limited to: walls, floors, ceilings and caps. Rated walls shall extend and key to floor, cap assembly or roof deck above using consistent materials.

Openings for "poke-through" pipe, conduit, etc., penetrations shall be of minimum size in accordance with UL published requirements for maintaining integrity of rated construction and fire sealed properly. Mortar or concrete in contact with copper will not be accepted. Expansive spray foam fill which is combustible shall not be allowed.

Opening shall be sealed full thickness of penetration, (i.e., grout solid up to within one (1) inch of finish surface then seal with rated sealant material). Any and all pipe and conduit penetrations of a finished wall, floor or ceiling materials shall be finished out with an approved escutcheon plate. Any penetration of rated walls or ceilings by mechanical ductwork shall be protected by use of rated fire damper system at point of penetration. Provide for collars as required at point of penetration through rated construction. Contractor shall provide fire integrity sign on rated wall construction (above ceiling) lines in accordance with the building code, and as outlined in PAINTING - SECTION 09910.

If specified under FIRESTOP CAULKING AND SEALING - SECTION 07840, fire caulking and sealing shall be **single source** provided using same approved materials and certified technicians throughout the project. All applicable trades shall coordinate accordingly and make their work ready to properly receive fire sealant. If fire sealing is not specified under a separate section, then all applicable trades shall fire seal their own work using the same mutually agreed upon fire sealing materials consistently throughout the project installed by manufacturer's certified technician(s). Acceptable fire sealing materials include, but are not limited to: Dow-Corning, 3-M Brand, Tremco meeting ASTM 3-119, ASTM 3-814 and mineral wool fiber safing.

USE AND OCCUPANCY PRIOR TO ACCEPTANCE BY OWNER

A. Contractor agrees to permit Owner to use and occupy portions of building or Project before formal acceptance by Owner, provided that Owner:
   1. Secures written consent of Contractor (except in event that in the opinion of Architect, Contractor is chargeable with unwarranted delay in final completion of contract requirements).

2. Secures endorsement from insurance carrier and consent of the surety, permitting occupancy and use of portions of project during remaining period of construction.

B. Use and occupancy prior to formal acceptance shall not relieve Contractor of his responsibility to maintain insurance coverage, as called for in specifications, for benefit of Owner, Owner's Agent, Contractor and all Subcontractors until Project is completed and accepted by Owner. However, use and occupancy of any area by the Owner prior to project completion shall mean partial acceptance of that area and any equipment within that area used by the Owner, thereby requiring a substantial completion agreement between the Owner and the Contractor for said area and equipment.

PROJECT SIGN

A. The General Contractor will erect a sign at the project site identifying the project. Wording for sign to be provided by the Owner through the Architect. Sign to be constructed of 3/4" x 4' x 8' exterior grade plywood with treated wood trim surround, mounted on two (2) 4" x 4" x 8'-0" treated wood posts, bottom of sign to be 3'-0" above finish grade. Sign painted with two coats best exterior grade alkyd paint before letters and graphics are painted on. 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.

B. Sign shall be single sided.

C. Location of sign to be coordinated with Architect and Owner and placed in a prominent location easily readable from existing street or roadway. Sign to be maintained in good condition until completion of Project. No other signs will be allowed on Project Site without the written approval of the Owner, issued through the Architect.

GEOTECHNICAL INVESTIGATION ENTITLED:
and Addenda, thereto:

"REPORT OF GEOTECHNICAL EXPLORATION "

PROJECT NO. To Be Determined

was prepared by: Terracon Consultants, Inc. - 2147 Riverchase Office Road, Birmingham, AL 35244.

The General Contractor and Subcontractors are responsible for familiarizing themselves with geotechnical information, for visiting the site, ascertaining the conditions thereof, and conditions under which work is to be done. The General Contractor shall include in their bid the cost of meeting the requirements and conditions of the geotechnical investigation.

A COPY OF THIS REPORT WILL BE ISSUED VIA ADDENDUM.

END OF SECTION

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 manufacturers 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. 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.

D. 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.

E. 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.

2.0 - PRODUCTS

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.

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.

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

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 (Optional)

A. Provide and maintain field office separate from the project of not more than 300 sq. ft. in area.

B. The entire facility, including furniture, will remain the property of the Contractor and shall be removed from the site by completion of the Work.

C. Portable office or trailer shall meet all appropriate regulation and 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.

E. Coordinate fence location with Owner prior to installation of fencing and gates. Fencing and gates shall not obstruct the Owner's daily operation of pedestrian, bus, and or car traffic.

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.

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.

   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.

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.
   d. 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.

_____ by:_____
General Contractor Authorized Signature

_____
Architect Job Name and Number

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

SECTION 01410 – QA/ QC, STRUCTURAL TESTS, AND STRUCTURAL SPECIAL INSPECTIONS

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.

D. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.

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 AND metal truss fabricators.

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 placemen, 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 ≤ 5/16

ii. Metal roof deck connections.

H. Trusses, Periodic Inspection

1. Inspect metal roof trusses and shop built components.

i. Inspect truss production in shop unless fabricator is approved by building official and submits certification of compliance at end of scope of work. Inspect 10% of trusses. Inspect 100% of trusses if discrepancies are observed.

2. Inspect site-built assemblies including site built trusses. Inspect erected trusses including bridging and attachments.

i. Inspect all site-built trusses. Inspect erected trusses and installation of bridging.

3. Inspect connection of truss elements including number of screws and attachment of connections of individual truss components.

4. Inspect truss to truss connections and truss to structure connections.

5. Inspect high-load diaphragms.

i. Inspect all diaphragms after installation is complete.

6. Inspect restraint/bracing.

i. For trusses spanning greater than 60ft, verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

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: *Baseball and Softball Complex Gadsden State Community College*

Location: *100 George Wallace Drive, Gadsden, Alabama 35903*

Owner: *Gadsden State Community College*

Design Professional in Responsible Charge: *H. Craig Winn, P.E.*

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:

H. Craig Winn, P.E.
(type or print name)

Signature Date

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

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

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 dur-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 disfigurations.

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

1.0 - GENERAL

A. This Section shall adhere to *General Conditions of the Contract and ACCS Form 2-F,* as issued by ACCS, 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 ACCS Form 2-5 and forward to

General Contractor.

B. One (1) copy of the Change Order is required and 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 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. Owner executes and returns Change Order to Architect.
7. Architect forwards Change Order to either the ACCS.
8. All parties will receive a copy of fully executed Change Order fy 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*" - "*ACCS Form 2-B* 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: *XYS 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
Building Demolition, Clearing and Grubbing
Site Protection
Site Clearing
Soil Poisoning
Earthwork
Ornamental Fence System
Chain Link Fencing
Water Distribution
Sanitary Sewerage
Storm Drainage
Synthetic Turf Base & Drainage
Fences and Gates
Synthetic Turf
Hot-Mix Asphalt Paving
Site Concrete Walks, Curbs & Paving

DIVISION 3 – CONCRETE
Cast-In-Place Concrete
Architectural Precast Concrete

DIVISION 4 – MASONRY
Unit Masonry

DIVISION 5 – METALS
Structural Steel
Steel Roof Deck
Cold Formed Metal Framing
Miscellaneous Metals

DIVISION 6 – CARPENTRY
Rough Carpentry
Finish Carpentry

DIVISION 7 – THERMAL AND MOISTURE PROTECTION
Solvent Type Dampproofing Coating
Building Insulation
Standing Seam Roof and Sheet Metal System
Wall Flashing
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 & Frames
Coiling Steel Door
Aluminum Windows
Finish Hardware
Glass and Glazing

DIVISION 9 – FINISHES
Tile
Acoustical Panel Ceilings
Resilient Rubber Base and Accessories
Painting

DIVISION 10 – SPECIALTIES
Architectural Louvers and Vents
Identifying Devices
Roof Information Plaque
Open Metal Athletic Sport Lockers
Protective Cover-Walkway
Protective Padding
Toilet Accessories

DIVISION 11 – SPECIAL CONSTRUCTION
Food Service Equipment
Concession Equipment

DIVISION 12 – FURNITURE AND FURNISHINGS
Fire Extinguishers
Miscellaneous Furnishings and Fixtures
Laminate Clad Casework

DIVISION 13 – SPECIAL CONSTRUCTION
Softball – Aluminum Bleacher and Press Box

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.

GENERAL CONTRACTOR WARRANTY FORM

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

PROJECT NAME: _____

GENERAL CONTRACTOR: _____

(Name and Address) _____

_____

PROJECT OWNER: _____

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

PROJECT SUBSTANTIAL COMPLETION DATE:

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.

If applicable, we warrant additional work, materials and equipment for One (1) Year on the following:

_____

_____

_____

_____

By: _____
(Name and Title)

Dated this _____ **day of** _____

State of Alabama
County of _____

Sworn to and subscribed before me this

_____ day of _____

_____
Notary Public

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, _____ (name), Subcontractor for _____ (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 Scope

The work under this section consists of all Building Demolition, Clearing and Grubbing.

1.2 Description

A. Work included

Building Demolition, Clearing and Grubbing required for this work includes, but is not necessarily limited to:

1. Complete Removal of concrete, concrete pavement and all concrete foundations.

2. Constructing temporary barriers around trees designated to remain.

3. Demolition and complete removal of buildings.

4. Disconnecting and removing all existing utility lines on service buildings designated to be removed; cap/terminate as required.

5. Removal of all debris

6. It shall be Contractor's responsibility to secure and pay for all fees, permits, etc., as required to complete selective demolition.

7. Capping of gas lines, sewer lines and water lines.

8. Building demolition requires the complete removal and subsequent offsite legal disposal of:

   a. All existing building components, systems, related structure (including but not limited to footings, foundations systems, underground piping and slabs), materials, rubble, etc., be removed, whether indicated or not.

B. Related work:

Division One of the Specifications

C. Definitions

The term "building demolition, clearing and grubbing", as used herein, includes the total removal of all existing building construction (except for those objects designated to remain) down to and below the existing ground level, plus such other work as is described in this Section of the specifications and as indicated.

1.3 Quality Assurance

A. Qualifications of workmen

Provide at least one person who shall be present at all times during demolition, clearing and grubbing operations and who shall be thoroughly familiar with the types of trees involved and who shall direct the trimming of roots and limbs where required.

B. Codes and Standards

In addition to complying with all pertinent codes and regulations, comply with the

requirements of those insurance carriers providing coverage for this work.

1.4 Job Conditions

A. Dust Control

1. Use all means necessary to prevent the spread of dust during performance of the work of this Section; thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site.

B. On-site burning will not be permitted.

C. Protection

1. Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner. Remove protections at completion of work.

D. Owner and Architect assumes no responsibility for actual condition of items or structures to be demolished.

E. All salvageable materials shall be removed by the owner prior to work starting. All items of salvage not wanted by the Owner shall be the property of the General Contractor and removed from job site.

F. Provide temporary barricades and other forms of protection as required to protect students, Owner's personnel and general public from injury due to demolition work.

G. 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.

H. Explosives: Use of explosives will not be permitted.

I. Utility Services:

1. Maintain existing utilities required to remain, keep in service and protect against damage during demolition operations.

2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

J. 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.

1.5 Submittals

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 control protection.

2.0 - PRODUCTS

2.1 Fill Material

A. Fill Dirt

Fill dirt for wells, if required, shall be clean dry soil obtained from off site.

B. Concrete

Concrete for filling and capping wells, if required.

2.2 Temporary Barricades

Unless otherwise specifically approved by the Architect, use only new and solid lumber of utility grade or better to construct temporary barricades around the objects designated to remain.

2.3 Pruning Paint

Use only a pruning paint specially formulated for horticultural application to cut or damaged plant tissue and approved by the Architect for use on this work.

2.4 Explosives

Do not use explosives for the work of this contract.

2.5 Other Materials

All other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to approval of the Architect.

3.0 – EXECUTION

3.1 Preparation

A. Notification

Notify the Architect at least 24 hours prior to commencing the work of this Section.

B. Site Inspection

1. Prior to all work of this Section, schedule and meet with the owner on site to carefully identify the limits of work and inspect the entire site and identify all objects designated to be removed and mark those to be preserved / protected accordingly.

2. Locate all existing utility lines and determine all requirements for disconnecting and capping.

3. Locate all existing active utility lines traversing the site and determine the requirements for their protection.

4. 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.

C. Clarification

1. The drawings do not purport to show all objects existing on the site.

2. Before commencing the work of this section, verify with the Architect all objects to be removed and all objects to be preserved.

D. Scheduling

1. Schedule all work in a careful manner with all necessary consideration for neighbors and the public.

2. Avoid interference with the use of, and passage to and from, adjacent buildings and facilities.

E. Disconnection of Utilities

Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or agency involved. Stub off and disconnect utility services that are not required to remain.

F. Protection of Utilities

Preserve in operating condition all active utilities traversing the site and designated to remain.

G. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building.

H. Provide shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

I. 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.

J. Provide erosion control measures as required by ADEM.

3.2 Demolition of Structures

Demolish all buildings designated for demolition, pulling out all foundations, basement walls, and concrete slabs; remove all existing pavement designated to be removed.

A. Perform demolition work in a systematic manner. Use such methods as required to complete work in accordance with demolition practices, standards and governing regulations.

1. Demolish and remove entire building structure, components, debris, rubble, etc., including footings and slabs.

2. 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.

3. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, roofs

or framing.

4. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

3.3 Other Demolition

Pull out all existing septic tanks and fuel lines, utility lines designated for abandonment, irrigation and leaching lines, and all other objects designated to be removed.

3.4 Clearing and Grubbing

A. Felling of trees

1. Use all necessary care to protect the roots and branches of trees designated to remain, and to prevent damage to persons and properties.

2. Immediately after felling a tree, remove the branches, cut trunk and limbs into firewood, and clear the debris.

B. Trimming of trees

1. In company with the Architect, ascertain the limbs and roots which are to be trimmed and clearly mark them to designate the approved point of cutting.

2. Cut evenly, using proper tools and skilled workmen to achieve neat severance with the least possible damage to the tree.

3. Promptly coat the cut area with the approved pruning paint in strict accordance with the manufacturer's recommendations.

4. In the case of root cuts, apply wet burlap or other protection approved by the Architect, as required, to prevent drying out.

C. Firewood

1. Cut all branches, roots and trunks larger than two inches in diameter into firewood not more than ten inches in diameter and from 22 to 26 inches long.

2. Pile all firewood in neat stacks not more than four feet high and only in the locations designated by the Architect.

3. Upon approval of the architect, tree portions which will be extremely difficult to make into firewood may be removed as debris.

4. All firewood made under this Section shall become the property of the Owner.

D. Grubbing

1. Remove all surface rocks and all stumps, roots and other vegetation within the limits of construction and/or as indicated by clearing limits shown on the Drawings.

2. Do not leave any root greater than three inches in diameter in the ground except as specifically approved by the Architect.

3.5 Disposal of Demolished Materials

A. Remove debris, rubbish and all 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.

3.6 Construction of Barricades

A. Layout

1. At all trees designated to be preserved, construct a temporary barricade around the tree at the tree's approximate drip line.

2. Make barricades at least three feet high, consisting of two inch by four inch or larger posts set at least 18 inches into the ground at not more that six feet on centers, joined at the top by one inch by six inch or larger boards firmly nailed to the posts.

B. Protection

1. Take special care in setting posts to not damage tree roots.

2. Do not permit stockpiling of materials or debris within the barricaded area nor permit the earth surface to be changed in any way except as specifically approved by the Architect.

3.7 Abandonment of Wells if Encountered

A. Fill with clean dry soil to within three feet of the surface.

B. Upper Three Feet
Cut off well casing at least three feet below existing or rough grade elevation, whichever is lower, and deposit concrete at least six inches over the top of the casing.

3.8 Clean-Up and Repair

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections, erosion control, etc. and leave areas 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.

C. Remove all debris from the site and leave the site in a neat and orderly condition to the approval of the Architect.

D. Clean and rake all areas free of debris. Earth fill areas of demolition to level of surrounding grades, with positive drainage. Provide 1"-2"" of topsoil and grass seed area. Provide hay mulch until grass takes full stand.

END OF SECTION

PUT ON DRAWINGS

Remove all electrical, telephone, CATV and other existing services to the buildings to be demolished. Coordinate with utility companies as required. Identify termination points for demolition of utility lines serving the buildings. Electrical contractor shall verify that all feeders have been removed back to source and are de-energized prior to building demolition.

All electrical work shall be performed by licensed electrician in accordance with the National Electrical code and any other applicable local codes and ordinances.

Locations of existing domestic water, sanitary and storm drainage system connections to local utilities not shown on demolition plans - show intended termination locations. Verify that termination/capping of existing utilities in demolition area will not disrupt utility service to existing building to remain

Any mechanical equipment to be removed should have refrigerant recovered per EPA guidelines.

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.
3. 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.

3.3 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 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. State and local codes shall control the disposal of trees, shrubs and other matter from the site clearing and grubbing operations.

C. The contractor shall notify the local agencies prior to beginning work, obtain all required permits, and shall be responsible for complying with their requirements.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and vegetation to remain.
2. Removing trees and other vegetation.
3. Clearing and grubbing (to include deep root systems).
4. Topsoil stripping.
5. Removing above-grade site improvements.
6. Removing below grade improvements.
7. Disconnecting, capping or sealing, and abandoning site utilities in place.
8. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:

1. Division 1 Section "Field Engineering" for verifying utility locations and for recording field measurements.
2. Division 1 Section "Construction Facilities and Temporary Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
3. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings according to Division 1 Section "Contract Closeout."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

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

1.7 PROJECT CONDITIONS

A. It shall be the contractor's responsibility to inspect the site to determine any discrepancies which would affect his work and to make allowable for such discrepancies in the contract sum and to notify the architect in writing of such discrepancies.

B. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.

D. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

E. Notify utility locator service for area where Project is located before site clearing.

2.0 - PRODUCTS

2.1 SOIL MATERIALS

A. Suitable Soil Materials: Requirements for suitable soil materials are specified in Division 2 Section 02300 "Earthwork."

3.0 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Locate and clearly flag trees and vegetation to remain.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 UTILITIES

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Excavate for and remove underground utilities indicated to be removed.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade or as required by Owner's on-site Geotechnical Engineer.
4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with suitable soil material, unless further excavation or earthwork is indicated.

1. Place fill material in accordance with Section 2300 Earthwork, to make the surface conform to the surrounding original ground surface.

C. Remove existing boulders above cut slope areas as needed to prevent toppling.

3.4 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Maximum slope of topsoil pile 3H:1V
2. Do not stockpile topsoil within drip line of remaining trees.
3. Dispose of excess topsoil as specified for waste material disposal.

4. Stockpile surplus topsoil and allow for re-spreading deeper topsoil.
5. Existing topsoil to not be used within the limits of the track. Off-site topsoil shall be used with the select soil blend.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing, full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL

A. Disposal: Remove surplus soil material, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02230

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. 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.

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, densification, 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. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
10. 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.

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 indemnity 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 & replacement shall be paid for using the unit prices provided in the bid.

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.

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.

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.

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 Work Included

The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein.

1.2 Related Work

Section 02300 - Earthwork
Section 03300 – Cast-In-Place Concrete

1.3 System Description

The manufacturer shall supply a total fence system of Ameristar Montage Plus®*Welded and Rackable* Ornamental Steel Majestic™ Basis of design. The system shall include all components (i.e., panels, posts, gates and hardware) required.

1.4 Quality Assurance

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.5 References

- ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- ASTM D523 - Test Method for Specular Gloss
- ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.6 Submittal

The manufacturer's product information and layout shall be submitted for approval prior to installation. See Section 01350 - Shop Drawings for more information.

1.7 Product Handling And Storage

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.8 Product Warranty

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

2.0 - MATERIALS

2.1 Manufacturer

The fence system shall conform to Montage Plus Majestic 2/3 rail 4'-0" high *Welded and Rackable* Ornamental Steel, Majestic design, extended picket bottom rail treatment, 3-Rail style manufactured by Ameristar Fence Products. Other manufacturers should submit for pre-approval at least 10 days prior to bid. See Section 01360 - Product Substitution.

2.2 Material

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft^2 (184 g/m^2), Coating Designation G-60.

B. Material for pickets shall be 3/4" square x 18 Ga. tubing. The rails shall be steel channel, 1.5" x 1.4375" x 14 Ga. Picket holes in the rail shall be spaced 3.500" o.c. for 3" air space. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.3 Fabrication

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrode position coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). **The color shall be Black**. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Commercial weight fences under ASTM F2408.

E. Gates with an out to out leaf dimension less than and including 72 inches shall be fabricated using Montage Plus ornamental panel material and 1-3/4" sq. x 14ga. gate ends. Gate leafs greater than 72 inches shall be fabricated using ForeRunner rails, 17 gauge pickets, intermediate uprights, gussets and 1-3/4" sq. x 14ga. gate ends. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

3.0 - EXECUTION

3.1 Preparation

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 Installation

Fence post shall be spaced according to Table 3, plus or minus ¼". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.3 Fence Installation Maintenance

When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.4 Gate Installation

Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

3.5 Cleaning

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Minimum Sizes for Montage Plus Posts

Fence Posts	Panel Height	
2-1/2" x 16 Ga.	Up to & Including 6' Height	
Gate Leaf	Gate Height	
	Up to & Including 4'	Over 4' Up to & Including 6'
Up to 4'	2-1/2" x 14 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12 Ga.	3" x 12 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 12 Ga.

Table 2 – Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).

Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Montage Plus – Post Spacing By Bracket Type

Span	For CLASSIC, GENESIS, MAJESTIC, & WARRIOR 8' Nominal (91.95" Rail)					
Post Size	2-1/2"	2-1/2"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Montage Plus Universal (BB112)	Montage Plus Line Blvd. (BB114)	Montage Plus Flat Mount (BB111)		Montage Plus Swivel (BB113)*	
Post Settings ± 1/4" O.C.	95"	95"	95"	95-1/2"	*95"	*95-1/2"

*Note: When using BB113 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.

END OF SECTION

1.0 GENERAL

1.1 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. Provide chain link fencing, chain link gates and slatsπ in accord with the requirements of this Section and as shown on the Drawings.

B. Related Work includes:
1. Section 03300 - Cast In-Place Concrete

1.3 QUALITY ASSURANCE:

Comply with applicable provisions of the following standards:

A. Specifications and Standards of the Chain Link Fence Manufacturers Institute (CLFMI).

B. American Society for Testing and Materials (ASTM) Specifications for Chain Link Fencing Materials.

1.4 SUBMITTALS:

A. Manufacturers' Data: Within 15 calendar days after Notice to Proceed, submit complete manufacturer's and/or supplier's data and instructions for all chain link fencing and gate materials.

2.0 MATERIALS

2.1 GENERAL:

A. Posts, Frames, Rails, Stretcher Bars, Truss Rods: Galvanized steel/PVC coated.

B. Reinforcing Wire: Galvanized high carbon steel/PVC coated.

C. Gate Hinges, Post Caps, Stretcher Bar Bands, Similar Items: Galvanized steel or malleable iron/PVC coated.

D. Ties, Clips: Galvanized steel/PVC coated..

2.2 COATINGS:

A. Galvanizing: All iron and steel parts hot dipped galvanized after fabrication. Zinc coating weight not less than 1.8 ounces per surface square foot.

B. Supplemental Color Coating: In addition to above metallic coatings, provide posts and rails with manufacturer's standard polymer coating according to ASTM F 1234, 10-mil minimum polyvinyl chloride (PVC) finish applied to exterior surfaces and, except for tubular shapes, to exposed interior surfaces. Color to match chain link fabric.

2.3 TOLERANCES: Standard mill tolerances for all framework members and chain link fabric.

2.4 FABRIC: Chain link fabric 9 gauge (0.148 inch) core wire, nominal 2" mesh, knuckle top and bottom selvages, with Class 2a PVC coating. Minimum breaking load of 1290 pounds. Furnish in widths and types shown on the Drawings.

2.5 CORNER, PULL, TERMINAL POSTS, INTERMEDIATE POSTS:

A. Size as shown on drawings and meeting the following:

Trade Size	Actual O.D.	Weight lbs/ft
2"	1.90"	2.72#
21/2"	2.375"	3.65#
3"	2.875	5.79#
4"	4.0"	9.10#

2.6 GATE POSTS: For swing gates under 6ft. in width - 3" (2.875" o.d.) steel pipe, nominal weight 5.79#/ft.; for swing gates over 6ft. in width - 4" (4.0" o.d. steel pipe, nominal weight 9.10#/ft.; provide diagonal 3/8" truss rods with turnbuckle at all corners, terminals and as detailed.

2.7 RAILS: 1 5/8" (1.66" o.d.) steel pipe, nominal weight 2.27#/ft.; not less than 18' lengths and fitted with couplings for connecting into continuous runs; couplings 6" long outside sleeves, 0.70 minimum wall thickness, allowing for expansion and contraction of rail. Join rails at intermediate posts with boulevard clamps.

2.8 POST CAPS AND RAIL ENDS: Sized to fit over outside of posts and rails to exclude moisture; ball caps for corner, terminal and gate posts, loop through caps to provide rail support for intermediate posts; rail ends brace banded to terminal and corner posts with 7/8" beveled galvanized steel brace band.

2.9 SWING GATES: Frames fabricated of steel pipe to size as shown on the Drawings; welded frame connections ground smooth prior to galvanizing; provide positive, locking latches with 1 3/8" o.d. drop bars and center-stops as detailed; provide gate stops set in concrete at each leaf full open position; provide gate post mounted keepers to automatically hold each leaf in full open position until manually released; locks provided by Owner.

2.10 HINGES: Tamper-proof with large bearing surfaces for clamping into position. Hinges will not twist or turn under action of gate.

2.11 STRETCHER BARS: 3/16" x 3/4" in lengths one inch less than full height of fabric with which they are used; provide one (1) stretcher bar for each terminal post; tow (2) for each corner, pull and gate post.

2.12 BANDS OR CLIPS: Flat or beveled steel 7/8" x .1156" of adequate strength for attaching stretcher bars to posts; install at intervals not to exceed 15".

2.13 FABRIC TIES: Steel ties for attaching fabric to rails and intermediate posts. Install at intervals not to exceed 14"o.c.

2.14 BOTTOM TENSION WIRE: No. 6 gauge galvanized spring coil steel wire; stretch taut from terminal post to terminal post and securely fasten to each intermediate post 2" above finished grade; weave through and attach to fence fabric at intervals not to exceed 24" with 6 ga galvanized steel wire.

2.15. PRIVACY SLATS: PDS Bottom Locking Slat, 7/8" width or approved substitute. Color selected by Owner.

2.16 OTHER MATERIALS: All other fittings, hardware, materials not specifically described but required for a complete and proper installation shall be as selected by the Contractor subject to the approval of the Landscape Architect.

3.0 EXECUTION

3.1 GENERAL:

A. Do not begin installation and erection before final grading is completed unless otherwise permitted.

3.2 INSTALLATION:

A. As detailed on the Drawings and as directed by the Landscape Architect.

B. Evenly space posts in the line of the fence as shown on Drawings and no further than 10' o.c.

C. Allow concrete footings to cure 72 hours minimum before applying any strain to posts.

D. Install posts, rails, gates and other similar items plumb, level and true to required line.

3.3 ADJUSTMENT: Adjust all gate hardware and lubricate where necessary.

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. All water mains shall be in strict accordance with the local water authority's requirements.

1.2 SUMMARY

A. This Section includes water-distribution piping and specialties outside the building for the following:

1. Water services.

B. Utility-furnished products include water meters that will be furnished to the site, ready for Installation.

1.3 DEFINITIONS

A. Water-Distribution Piping: Interior domestic-water piping.

B. Water Service: Exterior domestic-water piping.

C. The following are industry abbreviations for plastic materials:

1. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Piping specialties.
2. Valves and accessories.
3. Water meters and accessories.
4. Backflow preventers and assemblies.
5. Protective enclosures.

B. Shop Drawings: For the following:

1. Precast concrete vaults, including frames and covers, ladders an and drains.
2. Wiring Diagrams: Power, signal and control wiring.

C. Coordination Drawings: For piping and specialties including relation to other services in same area. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

D. Field Quality-Control Test Reports: From Contractor.

E. Operation and Maintenance Data: For specialties to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 include the following:

1. Water meters.
2. Valves.
3. Backflow preventers.
4. Protective enclosures.

F. Record drawings: At project close-out of installed water service piping according to Division 1.

G. Purging and disinfecting reports.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements." Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions".

B. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable water service piping, including materials, installation, testing and disinfection
3. Comply with standards of authorities having jurisdiction for fire suppression water-service piping, including materials, hose threads, installation and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

F. Comply with FM's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

G. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support piping to prevent sagging and bending.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Perform site survey, research public utility records and verify existing utility locations. Contact utility-locating service for the area where project is located.

C. Verify that water-service piping may be installed to comply with original design and reference standards.

D. Site information: Reports on subsurface condition investigations made during design of project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8. COORDINATION

A. Coordinate connection to water main with utility company.

B. Coordinate piping materials, sizes, entry locations and pressure requirements with building distribution & fire protection piping.

C. Coordinate with other utility work.

D. Coordinate electrical wiring for tamper switches, vault heaters, and sump pumps.

2.0 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint, bell- and plain-spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

2.3 PVC PIPE AND FITTINGS

A. PVC, Schedule 40 Pipe: ASTM D 1785.

1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.

B. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket and spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.
2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 JOINING MATERIALS

A. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.

B. Transition Couplings:

1. Underground Piping, NPS 1-1/2 and Smaller: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
2. Underground Piping, NPS 2 and Larger: AWWA C219, metal, sleeve-type coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
3. Aboveground or Vault Piping: Pipe fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.5 PIPING SPECIALTIES

A. Flexible Connectors:

1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

B. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, or plain end types; and matching piping system materials.

1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure to suit system pressures.
3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

    a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

4. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
5. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig minimum working pressure at 225 deg F.

2.6 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Nonrising-Stem, Metal-Seated Gate Valves: AWWA C500, gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

a. Minimum Working Pressure: 200 psig.
b. End Connections: Mechanical joint.
c. Interior Coating: Complying with AWWA C550.

2.7 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies: Comply with MSS SP-60. Include sleeve and valve compatible with drilling machine.

1. Tapping Sleeve: Cast- or ductile-iron or stainless steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

2. Valve: AWWA, cast-iron, nonrising-stem, metal or resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately 5-inch- diameter barrel.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

D Indicator Posts: UL 789, FM-approved, horizontal, wall-type, cast-iron body with operating wrench, extension rod, and cast-iron barrel.

2.8 CHECK VALVES

A. AWWA Check Valves:

1. Check Valves: AWWA C508, swing-check type with 175-psig working-pressure rating and resilient seat. Include interior coating according to AWWA C550 and ends to match piping.

B. UL-Labeled Check Valves:

1. Check Valves: UL 312, swing-check type with 250-psig working-pressure rating, rubber-faced checks unless otherwise indicated, and ends matching piping.

2.9 DETECTOR CHECK VALVES

A. Detector Check Valves: UL 312, galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends; designed for 175-psig working pressure. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.

1. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

B. Detector Check Valves: UL 312, FM-approved detector check, iron body, corrosion-resistant clapper ring and seat ring material, 175-psig working pressure, flanged ends, with connections for bypass and installation of water meter.

2.10 WATER METERS

A. Water meters will be furnished by the Contractor and shall be per the local water authority's requirements.

2.11 WATER-METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter with lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC, clay, or other pipe.

B. Description: Cast-iron body and double cover for disc-type water meter with lettering "WATER METER" in top cover; separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.

C. Description: Polymer-concrete body and cover for disc-type water meter with lettering "WATER" in cover; and slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.

2.12 HOSE-CONNECTION, BACKFLOW-PREVENTION DEVICES

A. General: ASSE standard, nonremovable-type, backflow-prevention devices with ASME B1.20.7, garden-hose threads on outlet.

B. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with manual drain feature. Units attached to rough-bronze-finish hose connections may be rough bronze.

C. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3m flow and applications with up to 10-foot head of water back pressure. Include two check valves and intermediate atmospheric vent.

2.13 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers.

1. Working Pressure: 150 psig minimum, unless otherwise indicated.
2. NPS 2 and Smaller: Bronze body with threaded ends.
3. NPS 2-1/2 and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

    a. Interior Lining: AWWA C550 or 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 if used in chrome-plated piping system.
6. Strainer: On inlet, if indicated.

B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

C. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013 or AWWA C511, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2, air-gap fitting located between two positive-seating check valves.

1. Maximum Pressure Loss: 12 psig through middle 1/3 of flow range.

D. Double-Check-Valve Backflow Prevention Assemblies: ASSE 1015 or AWWA C510, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves.

1. Maximum Pressure Loss: 5 psig through middle 1/3 of flow range.

E. Double-Check-Valve Backflow Prevention Assemblies: UL 312, FM approved; with two UL 312, FM-approved, iron-body, 175-psig working-pressure, flanged-end check valves and two UL 262, FM-approved, iron-body, outside screw and yoke, flanged, 175-psig working-pressure gate valves.

1. Maximum Pressure Loss: 5 psig through middle 1/3 of flow range.

F. Double-Check-Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.

1. Maximum Pressure Loss: 5 psig through middle 1/3 of flow range.

2.14 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.

B. Ladder: ASTM A 36, steel or polyethylene-encased steel steps.

C. Manhole: ASTM A 48, Class No. 35 minimum tensile strength, gray-iron traffic frame and cover.

1. Dimensions: Not smaller than 24-inch diameter, unless otherwise indicated.

D. Drain: ASME A112.21.1M, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.15 PROTECTIVE ENCLOSURES

A. Protective Enclosures, General: ASSE 1060, outdoor weather-resistant enclosure designed to protect aboveground water piping equipment or specialties from vandalism. Include size and dimensions indicated but not less than those required for access and service of protected unit.

B. Freeze-Protection Enclosures: Insulated and with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.

1. Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.
2. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

a. Housing: Reinforced-aluminum or fiberglass construction.

1) Drain opening for units with drain connection.
2) Access doors with locking devices.
3) Insulation inside housing.
4) Anchoring devices for attaching housing to concrete base.

b. Electric heating cable or heater with self-limiting temperature control.

C. Precast concrete base of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.

2.16 FIRE HYDRANTS

A. All fire hydrants shall be in accordance with the specifications and standards of the local fire department and the local water authority.

3.0 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

C. Do not use flanges, unions, or keyed couplings for underground piping.

D. Flanges, unions, keyed couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground Water-Service Piping: Use any of the following piping materials for each size range:

1. NPS 3/4 to NPS 3-1/2: PVC, Schedule 40 pipe and fittings
2. NPS 4 to NPS 8: Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed or joints or PVC, C900, Class 200 pipe and fittings.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, high-pressure, resilient seated gate valves with valve box.
2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FM, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:

    a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising-stem.
    b. Gate Valves, NPS 3 and Larger: UL/FM, cast iron, OS&Y rising stem.
    c. Check Valves: AWWA C508, swing-check valves.

4. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 JOINT CONSTRUCTION

A. See Division 2 Section "Utility Materials" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with keyed couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

4. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.
5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Division 2 Section "Utility Materials" for joining piping of dissimilar metals.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

E. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.

F. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36 inches cover over top.
2. Under Railroad Tracks: With at least 48 inches cover over top.
3. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.

G. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.

H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

I. Anchor service-entry piping to building wall.

J. See Division 15 Section "Domestic Water Piping" for potable-water piping inside the building.

3.6 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.

B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FM Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. Detector Check Valves: Install in vault or aboveground.

3.8 DETECTOR CHECK VALVE INSTALLATION

A. Install detector check valves for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

B. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.9 WATER-METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written requirements.

B. Water Meters: Install compound-type water meters, NPS 3 and larger, in meter vaults. Include shutoff valves on water-meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.10 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.11 BACKFLOW-PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers with relief drain in vault or other space subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.12 VAULT INSTALLATION

A. See Division 3 Section "Cast-in-Place Concrete" for concrete vaults.

B. Install precast concrete vaults according to ASTM C 891.

C. Connect drain outlet to storm drainage piping. Refer to Division 2 Section "Storm Drainage."

3.13 PROTECTIVE ENCLOSURE INSTALLATION

A. Install concrete base level and with top approximately 2 inches above grade.

B. Install protective enclosure over valves and equipment.

C. Anchor protective enclosure to concrete base.

3.14 CONNECTIONS

A. Piping installation requirements are specified in other Division 2 Sections. Drawings indicate general arrangement of piping and specialties.

B. See Division 2 Section "Utility Materials" for piping connections to valves and equipment.

C. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

D. Connect water-distribution piping to post hydrants and drinking fountains.

E. Connect water-distribution piping to interior domestic-water and fire-suppression piping.

F. Connect waste piping from drinking fountains to sanitary sewerage system. See Division 2 Section "Sanitary Sewerage" for connection to sanitary sewer.

G. Ground equipment according to Division 16 Section "Grounding and Bonding."

H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.15 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.16 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. See Division 2 Section "Earthwork" for underground warning tapes.

B. Permanently attach equipment nameplate or marker, indicating plastic water-service piping, on main electrical meter panel. See Division 2 Section "Utility Materials" for identifying devices.

3.17 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 02510

SECTION 02530 - SANITARY SEWERAGE

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.

B. All sanitary sewerage shall be in strict accordance with the local sanitary sewer authority.

1.2 SUMMARY

A. This Section includes sanitary sewerage outside the building.

B. Related Sections include the following"

1. Division 3 Section "Cast-in-Place Concrete" for concrete structures.

1.3 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure-Piping Pressure Ratings: At least equal to system test pressure.

1.4 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete manholes, including frames and covers.

B. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

C. Field Test Reports: Indicate and interpret results for compliance with performance requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt 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 utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting, materials.

2.2 PIPES AND FITTINGS

A. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
3. Gaskets: AWWA C111, rubber.

B. PVC Pipe: ASTM D 1785, Schedule 40 PVC, with plain ends for solvent-cemented joints.

1. Fittings: ASTM D 2466, Schedule 40 PVC, socket type.

2.3 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Concentric-cone type, unless eccentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, 6- to 9-inch total thickness, that match 24-inch diameter frame and cover.
8. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 60 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.

3. Grade Rings: Include two or three reinforced-concrete rings, 6- to 9-inch total thickness, to match 24-inch diameter frame and cover.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "SANITARY SEWER" cast into cover.

D. Manhole Cover Inserts: Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.

1. Type: Solid.

2.4 CONCRETE

A. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 2 percent through manhole.

2.5 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal-tar epoxy; 15-mil (0.38 mm) minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Concrete Manholes: On exterior and interior surfaces.

2. Manhole Frames and Covers: On entire surfaces.

2.6 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Light Duty: In earth or grass foot-traffic areas.

2. Medium Duty: In paved foot-traffic areas.

3. Heavy Duty: In vehicle-traffic areas.

4. Extra-Heavy Duty: In roads.

5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specification for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.

2. PVC pipe; PVC socket type fittings.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for non-pressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
2. Install piping with 36-in minimum cover.

F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated

B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.

C. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

D. PVC Pipe with PVC Fittings: According to ASTM D 2321 and ASTM F 1668.

3.7 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

3.8 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.9 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work strictly complies with local requirements.

B. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- Insert other thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Division 2 Section "Earthwork."

3.11 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfills is in place, and again at completion of project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball of cylinder of size not less than 92.5 percent of piping diameter.
    c. Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. If authorities having jurisdiction do not have published procedures, perform tests as follows:

    a. Sanitary Sewerage: Perform hydrostatic test.

        1) Allowable leakage is maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period.
        2) Close openings in system and fill with water.
        3) Purge air and refill with water.
        4) Disconnect water supply.
        5) Test and inspect joints for leaks.
        6) Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing". Use test pressure of at least 10 psig.

    b. Sanitary Sewerage: Perform air test according to UNI-B-6.

        1) Ductile-Iron Piping: Test according to AWWA C600, Section "Hydraulic Testing."

6. Manholes: Perform hydraulic test according to ASTM C 969.
7. Leaks and loss in test pressure constitute defects that must be repaired.
8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 02530

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 storm drainage outside the building.

1.3 DEFINITIONS

A. HDPE: High Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

C. RCP: Reinforced concrete pipe.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete manholes and other structures, including frames, covers, and grates.
2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.

B. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

2.0 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.2 PIPES AND FITTINGS

A. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

1. Soil-tight Couplings: AASHTO M 294, corrugated, matching pipe and fittings to form soil-tight joints.
2. Silt-tight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silt-tight joints.

B. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

a. Gaskets: ASTM F 477, elastomeric seals.

C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, (unless otherwise indicated) for gasketed joints.

1. Gaskets: ASTM C 443, rubber.

2.3 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for non-pressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
2. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
3. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
4. Bands: Stainless steel, at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for non-pressure joints.

1. Material for Concrete Pipe: ASTM C 443, rubber.
2. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
3. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

2.4 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches I.D. 5' depth, 60" I.D. > 5' depth, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Concentric-cone type, unless eccentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443 rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover. Final height adjustment can be made with courses of brick totaling no more than 16 inches.
8. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 48 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
4. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 48 inches deep.
5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
3. Steps: ASTM C 478, individual steps or ladder. Omit steps for manholes less than 48 inches deep.

D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.5 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section and having separate base slab or base section with integral floor.
2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
3. Top Section: Concentric-cone type, unless eccentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
4. Gaskets: ASTM C 443, rubber.
5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and grate.
6. Steps: ASTM C 478 individual steps or ladder. Omit steps for catch basins less than 48 inches deep.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Gaskets: Rubber.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and grate.
3. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channels and Benches: Concrete.
3. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches minimum, unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum

width flange, and 26-inch diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.6 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.

1. Include channels and benches in manholes.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 2 percent through manhole.

b. Benches: Concrete, sloped to drain into channel.

1) Slope: 4 percent.

2. Include channels in catch basins.

a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

1) Invert Slope: 2 percent through catch basin.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.

3.0 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

1. Use or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

A. General: Include watertight, silt-tight, or soil-tight joints, unless watertight or silt-tight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: As indicated on the drawings.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
1. Use the following pipe couplings for non-pressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install piping with 36-inch minimum cover, unless otherwise indicated.

F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Install with top surfaces of components, except piping, flush with finished surface.

C. PE Pipe and Fittings: As follows:

1. Join pipe, tubing, and fittings with couplings for soil-tight joints according to manufacturer's written instructions.
2. Install according to ASTM D 2321 and manufacturer's written instructions.
3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

D. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

E. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Install according to ASTM D 2321.

F. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
2. Arch Pipe: ASTM C 877, Type I, sealing bands.

G. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

H. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

3.8 CATCH-BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.9 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipators at outlets, as indicated.

3.10 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.11 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

C. Make branch connections from side into existing piping. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 18 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of

connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.12 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:

1. Remove structure and close open ends of remaining piping.
2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
3. Backfill to grade according to Division 2 Section "Earthwork."

3.13 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. Leaks and loss in test pressure constitute defects that must be repaired.
6. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 02630

1.0 GENERAL

1.1 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. The work under this Section will include, but not necessarily be limited to, the following, complete and in accord with the Specifications:
   1. Subgrade preparation and testing with a slope as shown on the Drawings.
   2. Laser grade subgrade, drainage layer and choker layer utilizing laser activated/controlled equipment from off-board transmitter to achieve accurate equipment blade positioning.
   3. Provision all materials, equipment, labor, services and incidentals as required to install a system of subsurface drainage piping, drainage layer media and related items.
   4. Testing as specified and/or required.

B. Related Work includes:
   1. Section 02220 - Earthwork
   2. Section 02731 - Synthetic Turf.

1.3 SUBMITTALS:

A. At time of Bid, submit the following contractor qualifications for the work of this section:
   1. Active membership, in good standing, with the American Sports Builders Association (ASBA) and/or The Synthetic Turf Council (STC)
   2 A list providing specific contacts and telephone numbers for ten (10) completed stone bases and drainage systems for athletic field projects. A minimum of three (3) of the projects are to be NCAA level of competition or higher.
   3. Resume of installation supervisor with a minimum of five (5) years experienced who will be present on-site during installation, including a list of installations and the qualifications of the workers.
   4. The Contractor is acceptable to the synthetic turf manufacturer/installer. Obtain in writing.

B. Submit manufacturer's product data for each product specified. Submit the manufacturer's specifications, product brochures, and installation instructions. Include details of construction relative to materials and dimensions of individual components, and certifications and other data required to show compliance with the contract documents.

C. Provide testing of drainage layer media for compliance with specified characteristics, bridging compatibility and final permeability (ASTM F2898-19) tests on the finished base stone. Submit results and maintain one (1) copy of all test results on-site for reference.

D. Provide testing of final surface planarity (EN13036-7). Submit results and maintain one (1) copy of test results on-site for reference.

1.4 STANDARDS:

A. ASTM Standard Test Methods / Specifications (latest standards):
   1. C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
   2. C88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
   3. D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
   4. F2898 Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method

B. European Standards:
   1. EN13036-7 Surface Regularity (3m Straight Edge)

C. American Association of State Highway and Transportation Officials (AASHTO)

1.5 QUALITY ASSURANCE:

A. Installer Qualifications:
   1. Provide competent workmen skilled in this specific type of synthetic grass base installation.
   2. The designated Supervisory Personnel on the project must be certified, in writing by the turf Manufacturer, as competent in the installation.

1.6 JOB CONDITIONS:

A. Dust Control:
   1. Use all means necessary to control dust on and near the Work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the Work or if resulting from the condition in which the Contractor leaves the site.
   2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public and concurrent performance of other work on site.

B. Protection:
   1. Use all means necessary to protect all materials of this Section before, during and after installation; to protect all objects designated to remain, existing construction and to protect the public.
   2. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

2.0 MATERIALS:

2.1 FILTER FABRIC:

A. Non-woven polypropylene. 4.5oz minimum.

B. Acceptable products:
   1. Propex, 451
   2. Mirafii , 140N.
   3. Haynes, NO4.5

2.2 DRAINAGE SYSTEM:

A. Geo-composite Drain Tile: Hydraway 2000, manufactured by Hydraway Drainage Systems (800-223-7015). 12" width roll or approved substitute.

B. For perforated drain; Advanced Drainage Systems, (ADS) N12, smooth interior wall corrugated, perforated class II (slot), polyethylene pipe or approved substitute. Diameters as shown on the Drawings. Furnish complete with bends, adapters, couplings, collars, fittings and joint materials.

2.3 DRAINAGE LAYER MEDIA:

A. General:
1. Approval Required: Drainage Layer Media is subject to the approval of the Owner's Representative at all times.
2. Mechanically crushed limestone or granite, angular and elongated in nature
3. Rounded or river stone is not acceptable
4. Drainage Layer Media to comply with AASHTO requirements and will be cleaned of and free of all deleterious materials as defined therein.
5. Provide testing of drainage layer media for compliance with specified characteristics and bridging compatibility. A minimum of three (3) initial samples of both media types will be tested for approval.

B. Provide Drainage Layer Media aggregate conforming to the following:
1. Stone Drainage Layer: Washed, crushed stone and meeting the following gradation: AASHTO #57 Stone
2. Stone Choker Layer: Washed, crushed stone and meeting the following gradation: AASHTO #89 Stone
3. LA Abrasion (ASTM C-131): <40
Sulfate Soundness (ASTM C-88): <12% (by weight)

2.4 OTHER MATERIALS: All other materials, not specifically described but required for a complete and proper installation, to be selected by the Contractor subject to the approval of the Owner's Representative.

3.0 - EXECUTION:

3.1 GENERAL:

A. Familiarization: Prior to all work of this Section, become thoroughly familiar with the site, site conditions, and all portions of the Work in this Section.

B. Inspect and test all areas of the site in the presence of the Owner's Representative. Check elevations, lines, grades, conditions to assure specified drainage layer media depths and final finished grades.

C. Operations Prior to Approvals:
1. Do not allow or cause any work to be performed or installed to be covered or enclosed by work of this Section prior to all required inspections, tests and approvals.
2. Should any work be so enclosed or covered before it has been approved, uncover at no additional cost to the Owner.
3. After work has been completely tested, inspected, and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

3.2 FIELD PREPARATION:

A. Subsurface Preparation:
1. Leveling: Remove all ruts, hummocks and other uneven surfaces by surface grading.
2. Laser grade areas as shown on the Drawings. Bring areas to uniform grade. Allow for drainage layer and synthetic turf placement. Maintain positive drainage on all surfaces as shown on the Drawings. Compact to 98% Standard Proctor (ASTM 698-21).
3. In the presence of the Owner's Representative, proof roll entire field with a 50,000 pounds gross weight, tandem dump truck with tires inflated to between 70psi and 90psi. Subgrade is to be non-yielding under the load. Correct any weak areas or areas that exhibit 'pumping' and retest.

B. Trenching/Subgrade Shaping:
1. Perform all trenching and subgrade shaping as required for the installation of the work of this Section.
2. Trench and shape as shown on the Drawings and as required for joining, backfilling and compacting.
3. Depth: As required to provide the elevations called for on the Drawings. Where elevations are not shown, trench and shape to sufficient depth to provide positive system drainage.
4. Correction of faulty grades: Where excavation is inadvertently carried below proper elevations, backfill with material approved by the Owner's Representative and then compact to provide a firm and unyielding subgrade and/or foundation to the approval of the Owner's Representative and at no additional cost to the Owner.

3.3 SUBSURFACE DRAINAGE SYSTEM:

A. Filter Fabric:
1. Install filter fabric as detailed providing required lap onto adjacent surfaces. Install to conform to all surfaces beneath fabric so that fabric will not be displaced during subsequent backfilling operations.
2. Secure fabric overlap to adjacent surfaces by stapling or other approved method. Install staples at centers sufficient to prevent displacement of fabric.
3. Overlap all fabric edges 12" minimum and secure using staples to prevent opening of joint.

B. Drainage System:
1. Install pipe in accord with Manufacturer's instructions and as specified herein.
2. Lay pipe as detailed and shown on the Shop Drawings, true to line and grade.
3. Install couplings, fittings and other appurtenances as required or detailed.
4. Terminate pipe as shown on Drawings. Remove burrs, rough and/or torn edges from cuts as directed.
5. Install geo-composite drain tile as detailed and in accord with Manufacturer's instructions, true to line and grade.

3.4 STONE DRAINAGE LAYER:

A. Stone Drainage Layer Fill:
   1. Place drainage media fill as detailed and required, using care not to damage or displace drainage system.
   2. Compact stone with a vibratory roller to settle, compact and align the stone facets in no more than 5" lifts.
   3. Install to assure complete cover of pipe. Leave no voids and compact to preclude settlement. Do not crush drainage system.
   4. Establish intermediate grade by laser grading methods and compact.

B. Stone Choker Layer Fill:
   1. Place media fill as detailed and required.
   2. Compact stone with a vibratory roller to settle, compact and align the stone facets.
   3. Establish final grade by laser grading methods and leveled by floating, matting or dragging to achieve smoothness over the entire area to receive synthetic turf. The final surface to be approved by the synthetic turf manufacturer/installer in writing.

C. The surface planarity tolerance is not exceed 0-1/4 inch over 10 feet and 0-½" from design grade (EN13036-7). Certification to be signed by Contractor.

D. Provide permeability tests (ASTM F2898-19) tests on the finished base stone prior to synthetic turf installation. Certify subsurface drainage was successfully tested before covering. Certification to be signed by Contractor.

3.5 TREATMENT AFTER COMPLETION OF GRADING:

A. After final grading is complete and the Owner's Representative has finished his observation, permit no further grading except with the approval of and observation of Owner's Representative.

B. Use all means necessary to prevent erosion of or damage to completed areas during construction and until final acceptance of the work.

END OF SECTION

1.0 - GENERAL

1.1 DESCRIPTION OF WORK

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

1.2 QUALITY ASSURANCE

A. Provide chain link fences and gates as complete units controlled by a single source including necessary erection accessories, fittings, and fastenings.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, and installation instructions for metal fencing, fabric, gates and accessories.

2.0 - PRODUCTS

2.1 GENERAL

A. Dimensions indicated for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.

1. Fence shall be as indicated on Drawings.

2.2 STEEL FABRIC

A. Fabric: Extruded, No. 9 ga., before vinyl coating, size steel wires, 2" mesh, with all top selvages knuckled.

1. Furnish one piece fabric widths.
2. Vinyl fabric shall be fused and bonded per ASTM F-668-93A Sec. 1.2.3 Class 2b.

2.3 FRAMING AND ACCESSORIES

A. Steel Framework, General: Vinyl coated framework shall be SS-20.

1. Fused and bonded PVC coated fittings and accessories.

B. Provide chain link fence fabric and gates of 2", knuckle and knuckle, copper bearing steel fabric.

C. End, Corner and Pull Posts: Minimum sizes and weights as follows:

1. Up to 6' fabric height, 2.875" OD steel pipe, 5.79 lbs. Per lin. Ft.
2. Over 6' fabric height, 3" OD steel pipe.

D. Line Posts: Space 10' o.c. maximum, unless otherwise indicated, of following minimum sizes and weights.

1. Up to 6' fabric height, 1.90" OD steel pipe, 2.70 lbs. per lin. ft.

2. Over 8' fabric height, 2.875" OD steel pipe, 5.79 lbs. per lin. ft.

E. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

1. Leaf width up to 6', 2.875" OD pipe, 4.85 lbs. per lin. ft.

F. Top Rail: Manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint. Provide means for attaching top rail securely to each gate, corner, pull and end post.

1. 1.66" OD pipe, 2.27 lbs. per ft.

G. Tension Wire: 7-gage, coated coil spring wire used in lieu of bottom rail.

1. Locate at bottom of fabric.

H. Wire Ties: 11 ga. galvanized steel or 11 ga. aluminum wire, to match fabric core material.

I. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.

J. Post Tops: Provide weathertight closure cap with loop to receive tension wire or top rail; one cap for each post.

K. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.

L. Stretcher Bar Bands: Space not over 15" o.c., to secure stretcher bars to end. Corner, pull, and gate posts.

2.4 GATES

A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8' apart unless otherwise indicated.

1. Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.
2. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

B. Swing Gates: Fabricate perimeter frames of minimum 1.90" OD pipe.

C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:

1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over 6" nominal height.
2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

D. Concrete: Provide concrete consisting of portland cement, ASTM C 150, aggregates, ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

3.0 – EXECUTION

3.1 INSTALLATION

A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

B. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

1. If not indicated on drawings, excavate holes for each post to minimum 12" diameter.
2. Unless otherwise indicated excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

C. Setting Posts: Center and align posts in holes 3" above bottom of excavation.

1. Place concrete around posts and vibrate or tamp for consolidation. Check each post of vertical and top alignment and hold in position during placement and finishing operations.
2. Unless otherwise indicated, top of concrete footings shall be 2" below finish grade.

D. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.

E. Center Rails: Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.

F. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

G. Tension wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.

H. Fabric: Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.

I. Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.

J. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

K. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons or clothing.

L. Tie fabric to line posts, with wire ties spaced 12" o.c. Tie fabric to rails and braces, with wire ties spaced 24" o.c. Tie fabric to tension wires, with hog rings spaced 24" o.c.

M. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION 02710

1.0 GENERAL

1.1 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. Furnish all labor, materials, tools and equipment necessary to install all synthetic turf as indicated on the Drawings. The installation of all new materials shall be performed in strict accordance with the manufacturer's installation instructions and in accordance with all approved shop drawings.

B. Perimeter edge attachment required for the system shall be as shown on the Drawings and as recommended by the manufacturer.

C. Related Work includes:
1. Section 02710 - Synthetic Turf Base and Drainage

1.3 SUBMITTALS:

A. Prior to the Landscape Architect approval of a specified synthetic turf system, specify in writing that turf system does not violate any other manufacturer's patents, patents allowed or patents pending.

B. Standard printed specifications of the synthetic turf system to be installed on this project along with Manufacturer's data.

C. An affidavit attesting that the synthetic turf material to be installed meets the requirements defined by the manufacturer's currently published specifications and any modifications outlined in those technical specifications.

D. Three (3) synthetic turf samples, 6"x6"in size, of each type and color of the same synthetic turf to be installed.

E. Certify that the crumb rubber infill (CRI) is derived from only used, whole, vulcanized automobile, SUV, or truck tires and produced in compliance with North American tire manufacturing specifications. Shipment and/or Order Certification shall include at least the following information:
1. Type and origin of raw material (certify that it comes from tires)
2. Production facility
3. Production method (cryogenic or ambient)
4. Fiber content (%)
5. CRI sieve/gradation analysis

F. Prior to ordering of materials:
1. Submit Shop Drawings indicating:
   a. Field Layout
   b. Field Marking Plan and details.
   c. Roll/Seaming Layout
   d. Methods of attachment and perimeter conditions.
   e. Installation details; edge detail, other insets and covers.
2. Submit the fiber manufacturer's name, type of fiber and composition of fiber.

1.4 G. Prior to Final Acceptance, submit to the Owner:

1. Three (3) copies of Maintenance Manuals, which will include all necessary instructions for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
2. Project Record Documents: Record actual locations of seams, drains or other pertinent information.
3. Warranty: Submit Manufacturer Warranty and ensure that forms have been completed in Owner's name and registered with Manufacturer

1.5 STANDARDS:

A. ASTM Standard Test Methods (latest standards):

D1577- Standard Test Method for Linear Density of Textile Fiber
D5848- Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
D418- Standard Test Method for Testing Pile Yarn Floor Covering Construction
D1338- Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
D1682- Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
D5034- Standard Test Method of Breaking Strength and Elongation of Textile Fabrics(Grab Test)
F1015- Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
D4491- Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D2859- Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
F355- Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.
F1936- Standard Test Method for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
D1557- Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

B. National Federation of State High School Associations (NFHS)

C. The Synthetic Turf Council, Inc., Suggested Guidelines for Crumb Rubber in Synthetic Turf Systems.

D. The Synthetic Turf Council, Inc., Guidelines for the Essential Elements of Synthetic Turf Fields.

1.6 QUALITY ASSURANCE:

A. Manufacturer Qualifications:

1. Company specializing in manufacturing products specified in this section.
2. Experienced in the manufacture and installation of specified type of infilled slit-film grass system for a minimum of three years. This includes use of a slit-film fiber, backing, the backing coating, and the installation method.
3. Have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.

1.7 B. Installer Qualifications:

1. Provide competent workmen skilled in this specific type of synthetic grass installation.
2. The designated Supervisory Personnel on the project must be certified, in writing by the turf Manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the infill mixture.
3. The Manufacturer shall have a representative on site to certify the installation and Warranty compliance.

C. Prior to the beginning of installation, the installer of the synthetic turf shall inspect the sub-base and accept in writing the sub-base surface planarity and compaction. The Installer shall have the dimensions of the field and locations for markings measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.

D. Provide the necessary testing data to the owner that the finished field meets the required shock attenuation, as per ASTM F1936.

1.8 DELIVERY, STORAGE AND HANDLING:

A. Deliver products to project site in wrapped condition.

B. Store products under cover and elevated above grade.

1.9 WARRANTIES:

A. Refer to General Conditions of the Contract, Article 35 for additional requirements.

B. Provide a warranty to the owner that covers defects in materials and workmanship of the turf for a period of 8 years from the date of Substantial Completion. The turf manufacturer must verify that their onsite representative has inspected the installation and that the work conforms to the manufacturer's requirements.

C. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the owner or the manufacturer.

D. Provide a Warranty to the owner that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the Manufacturer's onsite representative.

E. All turf warranties shall be non-prorated, limited to repair or replacement of the affected areas, at the option of the Manufacturer, and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs. All warranties are contingent on the full payment by the Owner of all pertinent invoices.

1.10 MAINTENANCE SERVICE

A. Train the Owner's facility maintenance staff in the use of the turf Manufacturer's recommended groomer.

B. Train the Owner's facility maintenance staff in daily maintenance and proper upkeep of the field.

2.0 - PRODUCTS

2.1 GENERAL

A. The turf fabric shall be manufactured and installed by a sole responsible entity. Installation "subcontractors" shall not be permitted unless pre-qualified and approved by the Landscape Architect.

B. All components and their installation method shall be designed and manufactured for the use on outdoor athletic fields. The materials specified are to withstand full climate exposure, be resistant to insect infestation, rot, fungus, mildew, ultra-violet light and heat degradation, and shall have the basic characteristics of flow through drainage, allowing free movement of surface run-off through the turf and into the subsurface drainage layer.

C. The finished playing surface shall appear as mowed grass with no irregularities.

2.3 MANUFACTURERS:

A. SprinTurf – GrandSlam is the basis of design:
1. Infield: 2" fiber height, 52 oz. DFE Extreme, 4lbs. of sand per SF ballast1lb. of GreenPlay Fibre per SF on top of the sand.
2. Outfield: 2" fiber height, 46 oz. DFE Extreme, 3lbs. of rubber and 3lbs. of sand per SF.

B. Approved manufacturers are as follows:
1. SprinTurf / GrandSlam
2. AstroTurf
3. Field Turf
4. Shaw Sports Turf

2.4 FIELD GROOMER

A. Provide one (1) Greens Groomer, model #920SDE or equivalent.

3.0 EXECUTION

3.1 GENERAL:

A. The installation shall be performed in full compliance with approved Shop Drawings.

B. Only trained technicians, skilled in the installation of athletic synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, topdressing or brushing operations.

C. The designated supervisory personnel on the project must be certified, in writing by the turf Manufacturer, as competent in the installation of the system.

3.1 D. All designs, markings, layouts, and materials shall conform to all currently applicable NFHS rules and other standards that may apply to this type of synthetic grass installation.

3.2 EXAMINATION:

A. Verify that all sub-base, drainage and leveling is complete prior to installation.

B. The surface to receive the synthetic turf shall be inspected by the Installer, and prior to the beginning of installation, the Installer must accept in writing the sub-base surface planarity and compaction. The surface must be perfectly clean as installation commences and shall be maintained in that condition throughout the process.

C. The compaction of the aggregate base shall be 95%, according to Standard Proctor, and the surface tolerance shall not exceed 0-1/4 inch over 10 feet and 0-½" from design grade.

3.3 INSTALLATION:

A. Install system in accordance with Manufacturer's instructions. Any variance from these requirements must be accepted in writing, by the Manufacturer's onsite representative, and submitted to the Landscape Architect/Owner, verifying that the changes do not in any way affect the warranty. Infill materials shall be approved by the Manufacturer and installed in accordance with the Manufacturer's standard procedures.

B. The turf rolls are to be installed directly over the properly prepared base. Extreme care should be taken to avoid disturbing the base, both regarding compaction and planarity. Repair and properly compact any disturbed areas of the base.

C. No head or cross seams will be allowed in the main playing area between the foul lines. Utilizing sewing procedures, each roll shall be attached to the next.

D. Install specific inlays as required by the drawings and specifications and in accordance with the Manufacturer's standard procedures.

E. Apply infill materials in numerous thin lifts. Brush turf as the mixture is applied. Place so that there is a void of a minimum of ¾" to the top of the fibers

F. Install the infill to fill the voids between the fibers and allow the fibers to remain vertical and non-directional.

G. Attach turf to the perimeter edge detail in accordance with the Manufacturer's standard procedures. Edge detail shall result in a straight, tight, firmly attached edge that will resist de-lamination forces associated with normal play and use.

H. Provide hook and loop attachment for all batter's box, catcher's box and pitching lanes panels for ease of replacement. Initial panels and replacement panels are to extend beyond the white lines defining the area.

3.4 FIELD MARKINGS:

A. The field will have the following lines tufted according to NFHS standards:
1. Softball: as shown on the contract drawings.

B. All other field markings to be inlaid according to NFHS standards and the Drawings:

3.5 CLEANING:

A. Protect installed turf from subsequent construction operations.

B. Do not permit traffic over unprotected surface.

C. Provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.

D. All usable remnants of new material shall become the property of the Owner.

E. Keep the area clean throughout the project and clear of debris.

F. Clean as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

3.6 OTHER MATERIALS AND EQUIPMENT:

A. Repair Materials – Upon substantial completion, provide directly to Owner the following items in the minimum quantities indicated:
   1. Turf Fabric, 500 s.f. with at least one piece 15' wide and 30' long.
   2. 4" width Color Fabric, Minimum 100 l.f. of each color specified for inlaid line striping.
   3. 500 lbs. ground rubber in weatherproof bags.

B. Replacement Panels:
   1. Provide eight (8) batter's boxes.
   2. Provide eight (8) catcher's boxes.
   3. Provide four (4) pitcher's lanes.

C. Provide and install the following field equipment
   1. Provide six (6) 'Jack Corbett' bases w/ anchors and plugs for three (3).
   2. Provide four (4) 'Hollywood all rubber in-ground home plates.
   3. Provide four (4) 'Hollywood' 4-way pitchers rubbers.

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.

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 (85 deg C).

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

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 ¾-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 sub- stances.

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 (Fl) 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 - Fl 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 35 - Fl 20. 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.

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 Dustproofer: 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.

END OF SECTION 03300.

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 mansory 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 2021 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 2021 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 school brick predominant on buildings in the school complex 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.

D. Brick Schedule
1. Contractor to provide an allowance (materials only) for the brick. See Section 01020 – Allowances.

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 C91

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.

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 Wire Ties and Cornices

A. Individual units prefabricated from bent wire to comply with requirements indicated below:
1. Type for Masonry where Whythes 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 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.

2.9 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 Wythe 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.

2.10 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: Manufacturer's standard strength cleaner designed for removing mortar/grout stains, efflorescence and other 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.

2.11 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 coursing, bonding, color, and texture of existing 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 Masonry:
1. Lay CMU in running bond pattern

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 non load-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 non load-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 prefabricated "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 prefabricated "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 his purpose. Verify compatibility of adhesive and bituminous damproofing 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, ½" 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.

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 the following:

1. Roof deck.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
2. Division 09 painting Sections for repair painting of primed deck.

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 including manufacturer's specifications and installation instructions for each type of decking and accessories.

1. Provide test data for mechanical fasteners used fastening deck to supporting structures.

C. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:

1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members."

2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."

3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."

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. Bowman Metal Deck Div., Cyclops Corp.
2. Consolidated Systems, Inc.
3. Epic Metals Corp.
4. Marlyn Steel Products, Inc.
5. H. H. Robertson Co.
6. Roll Form Products, Inc.
7. Roof Deck, Inc.
8. United Steel Deck, Inc.
9. Vulcraft Div., Nucor Corp.
10. Wheeling Corrugating Co.

2.2 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 653/A 653M, grade as required to comply with SDI specifications.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

D. Galvanizing: ASTM A 525, G60.

E. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.3 PRODUCTS

A. ROOF DECK.

1. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade **33**, **G60** zinc coating.
3. Deck Profile: SEE PLAN
4. Profile Depth: SEE PLAN
5. Design Uncoated-Steel Thickness: SEE PLAN
6. Span Condition: Triple span or more.
7. Side Laps: Overlapped

2.4 ACCESSORIES:

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

C. Mechanical Fasteners: Corrosion-resistant self-drilling, self-threading screws.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

G. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

2.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Locate mechanical fasteners and install according to deck manufacturer's written instructions, and these drawings and specifications.

2.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by mechanical fasteners:

1. Screw Diameter: #12 nominal.
2. Screw Spacing: SEE PLAN

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps as noted on drawings. Fasten perimeter edges of at intervals not exceeding 12" and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws or 5/8" diameter puddle welds as indicated on drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

2.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

F. Test all weld studs according to applicable standards.

2.5 REPAIRS AND PROTECTION

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

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

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 trusses
   a. Gable-shaped trusses.
   b. Piggyback trusses.
   c. Drag strut trusses.
4. 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 Trusses: Vertical deflection of 1/240 of the span up to ¾ inch total dead load and ¾ inch total live load.
    d. Roof Rafter Framing: Horizontal deflection of 1/240 of the horizontally projected span up to ¾ inch total dead load and ¾ 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 on three copies only unless specified in the general conditions. Two prints will be returned to the architect. All other reproductions required by the Contractor are the responsibility of the Contractor and shall be made after reproducible is returned.
   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.
   7. Provide permanent bracing drawings for the metal stud truss system. Permanent bracing shall be designed by the contractor under the direct supervision of the professionally registered engineer licensed in the state that the project is located. The permanent bracing shop drawings and calculations shall be submitted with the truss shop drawings and calculations. The permanent bracing and metal stud shop drawings are to be considered one submittal. If one is submitted without the other the submittal will be returned rejected.

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 TRUSSES

A. Roof Truss Members: Manufacturer's standard-shape steel sections, C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges. Proprietary shape trusses are acceptable provided all engineering calculations are performed by the manufacturer or his agent.

1. Minimum Base-Metal Thickness: as required by structural performance..
2. Flange Width: as required by structural performance.
3. Section Properties: as required by structural performance.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 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 TRUSS INSTALLATION

A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.

B. Truss Spacing: 48 inches (1220 mm).

C. Do not alter, cut, or remove framing members or connections of trusses.

D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.

E. Erect trusses without damaging framing members or connections.

F. Align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

G. Install continuous bridging and permanently brace trusses as required by structural performance and designed according to LGSEA's Technical Note 551e, "Design Guide for Permanent Bracing of Cold-Formed Steel Trusses."

H. Trusses shall be braced against racking. Lifting of trusses shall be done so as to not cause local distortion in any member.

I. All trusses shall be erected using equipment of adequate capacity to safely perform the work.

J. The General Contractor is responsible for checking the dimensions and assuring the fit of all members and trusses before erection begins.

K. All work shall be erected plumb and level and to dimensions and spacings indicated on the drawings. Provide bridging and permanent bracing as shown in the shop drawings.

L. Assemblies shall be of the size and spacing shown on the approved shop drawings.

M. Provide web stiffeners and reinforcement at reaction points where required by analysis or to suit details.

N. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members.

O. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.

P. Anchor trusses securely at all bearing points to comply with methods and details indicated.

Q. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand design loads, and comply with other indicated requirements.

R. Do not cut or remove truss members.

S. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

T. 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.

3.8 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.

3.9 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

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. Downspout Boots shall be equal to Jay R Smith MFG. Co. (Smith Industries) special downspout boots. Cast Iron Body with 3" Bronze Access Plug and Strap with 5/16" Dia. Cast Holes for flat head bolts, Typical. 5 x 4 Size.

D. Gutter Sidewalk Box shall be equal to McKinley Light Duty Type GBC with checker plate cover to Type GCG with grating. Cast iron asphalt coated, size and length as required to match downspout sizes shown. Note - Boxes may be fabricated from steel tubing, galvanized after fabrication.

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 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 Plywood

A. Each panel of softwood plywood shall be identified with the DFPA grade trademark of the American Plywood Association and shall meet the requirements of Product Standard PS 1-66 for Softwood Plywood Construction and Industrial. All plywood which has any edge or surface permanently exposed to the weather shall be of the exterior type.

B. Plywood sheathing and/or decking shall be DFPA Standard with exterior glue, thickness as shown on the drawings or required for the intended use. Square edge or tongue and groove as approved.

C. Plywood for roof decking shall be 3/4" minimum CDX with C grade up. Provide “H” clips at mid-span of edge joints.

2.3 Oriented Strand Board (OSB)

A. Shall be used for floor, wall and roof sheathing in light commercial construction applications as indicated. Each panel is third-party certified

for quality and is rated for Exposure 1 bond durability for protected applications and limited exposure during normal construction delays. OSB shall be edge coated to limit absorption and pick-up of moisture. OSB shall be equal to Georgia -Pacific Blue-Ribbon OSB.

2.4 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.

2.5 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.

2.6 Temporary Closures

Provide batten doors with locks at all exterior openings. Appropriate protection against weather and life safety shall be maintained throughout the job.

2.7 Blocking

Provide solid blocking at all grab bars, millwork cabinets and wall mounted units. Coordinate with Installer and/or Manufacturer.

2.8 Building Wrap - Provide building wrap over exterior surface of all exterior walls as recommended by manufacturer. Building Wrap shall be approved equal to Tyvek.

2.9 Air /Moisture Barrier - Provide building wrap over exterior surface of all exterior walls as recommended by manufacturer. Basis of Design: Spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon Dupont Tyvek Commercial Wrap and related assembly components.

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.

D. Wood Studs shall not exceed 16" o.c. Provide stud framing for walls to receive

ceramic tile at 12" o.c.

E. Plywood Roof Decking shall be installed with a 1/8" expansion gap between abutting sheets, all sides.

F. All Roof Deck fasteners shall be 100% within roof framing. Nails missing or by-passing structural rafter members shall be subject to correction.

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-fibered 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, fibered, 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 fibered, 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. Wet insulation shall be rejected.

2.0 - PRODUCTS

2.1 Material

A. 1. Primary: FSK Thermal insulation shall be batt, or blanket type having a vapor barrier on one face which shall be extended to form a 1" flange to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E - 84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts. Vapor barrier side laps shall be lapped and taped over support members. Vapor barrier materials shall be FSK foil-type and also comply with requirements for a ceiling return air plenum regardless.

2. Supplemental: Unfaced Thermal insulation shall be allowed provided it is coupled with a layer of FSK faced insulation to achieve the total required r-value and shall be batt, or blanket type to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E-84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts.

Thermal Resistance Values (R) as follows:

R-38 12”
R-30 9" - 10"
R-22 7"
R-19 6" - 6-1/2"
R-11 3-1/2" - 4"

B. Unfaced Thermal insulation shall be batt, or blanket type to comply with requirements of International Building Code. ASTM - C665 Type III, Class A and ASTM E - 84. The insulating material shall be fire and decay-proof, moisture-resistant mineral or glass wool specifically designed for use in insulating batts.

Thermal Resistance Values (R) as follows:

R-38 12”
R-30 9" - 10"
R-22 7"
R-19 6" - 6-1/2"
R-11 3-1/2" - 4"

C. 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 @ 75ºF 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.

D. Rigid thermal insulation shall be 1" 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.

E. Air/Vapor Barrier - Basis of Design: Spunbonded polyolefin, non-woven, non-perforated barrier equal to Dupont Tyvek Commercial Wrap, Class A and related assembly components. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations.

1. Shall be allowed as a substitution and similar to FSK facing material. As such this material would be used in conjunction with unfaced insulation and shall be provided continuous and attached to applicable framing members. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations.

3.0 - EXECUTION

3.1 Installation

A. Thermal Insulating material shall be laid tight and installed so as to avoid gaps and settlement. All voids, offsets, and bends shall be completely filled. R values shall be provided as indicated in single layer or multiple layers totaling the "R" value indicated. If multiple layers are used to meet total "R" value indicated, layers must be provided perpendicular to one another. The layer closest to the conditioned space must be provided with FSK facing on the interior face where visible for an Inspection.

Insulation shall be laid tight and continuous over all areas where indicated.

B. 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.

C. 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.

4. If adhesive is required, use mastic for bonding foam board to non-absorbent surfaces such as dense concrete, metal, brick, glass, and paint.

D. Mesh, shall be provided for supporting overhead horizontal insulation and attached to applicable framing members as required, not to exceed 16" o.c. Mesh material shall be provided to maximize width as project conditions permit. Mesh fabric shall be steel wire type with nominal 2" grid. Continuous metal straps at 16" o.c. shall be

an acceptable substitute.

E. Air/Vapor Barrier - Shall be allowed as a substitution and similar to FSK facing material. As such this material would be used in conjunction with unfaced insulation and shall be provided continuous and attached to applicable framing members. All seams, edges and penetrations shall be taped and sealed per manufacturer's recommendations. Basis of Design: Spunbonded polyolefin, non-woven, non-perforated barrier equal to Dupont Tyvek Commercial Wrap, Class A and related assembly components.

END OF SECTION

1.0 - GENERAL

1.1 Scope

Section includes a complete Architectural Standing Seam Metal Roofing System with preformed and pre-finished standing seam metal roofing panels, underlayment, fasteners, clips, perimeter and penetration flashings, roof curbs, cap flashing, closures, sealant, gutters, downspouts, seam caps, trim, vapor barriers, expansion joint covers, soffit system and miscellaneous accessories required to provide the entire roofing and sheet metal assemblies complete and weathertight as intended by contract documents.

1.2 Related Sections

A. Section 06100 - Rough Carpentry
B. Section 07910 - Caulking and Sealants
C. Mechanical/Plumbing - See Drawings
D. Electrical - See Drawings

1.3 References

A. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members, (August, 1986).

B. American Institute of Steel Construction (AISC) Manual of Steel Construction, (Current Edition).

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

1. A446: Specification for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process, structural (physical) property.

2. A525: Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

3. A792: Specification for Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

4. E283: Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.

5. E331: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1. 1987 Architectural Sheet Metal Manual.

E. Underwriter's Laboratories (UL) Building Materials Directory:

1. UL 580: Tests for Wind Uplift Resistance of Roof Materials.

1.4 Quality Assurance

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.

D. Manufacturer Qualifications:
Provide primary roofing material products from a single source including under layments all produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.

E. Installer's Qualifications: Installer / sub-contractor must be currently in the primary business of roofing with not less than (5) five consecutive years of recorded successful experience with roofing systems comparable to that of this project under the same company name and be **authorized by the roofing material manufacturer as trained and approved for installation** of such roofing materials indicated for this project. Joint ventures shall not be allowed.

F. A full-time field supervisor or foreman with minimum of (5) years of experience in a roofing supervisory role, having performed on projects of comparable scope and type shall be required to be on site at all times during roofing work.

G. The Roofing Contractor shall be responsible for weathertightness of the entire roofing system.

H. The Roofing Contractor shall inspect and accept condition of the roof deck and components of mechanical penetrations prior to installation of the roofing system.

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.

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.

1.5 Pre-Roofing Conference:

A. Prior to roof deck installation, a required Pre-Roofing Conference shall be held as scheduled by Architect upon request by the Contractor. Required attendees include the Owner, Architect, Inspector, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment. Comply with requirements in Division 1.

B. Immediately prior the Roofing installation work, the General Contractor shall hold a subcontractors pre-installation meeting at the site to review matters discussed at the State required Pre-Roofing Conference, methods and procedures related to roofing system including, but not limited to, the following:

1. Review methods and procedures related to roofing installation, including manufacturer's written instructions and warranty requirements.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Examine and accept deck substrate conditions for compliance with requirements, including flatness and fastening.

4. Review structural loading limitations of roof deck during and after roofing.

5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

6. Review governing regulations and requirements for insurance and certificates if applicable.

7. Review temporary protection requirements for roofing system during and after installation.

8. Review roof observation and repair procedures.

1.6 System Description

A. Design Requirements:

1. Architectural Standing Seam Metal Roofing System with continuous, one-piece, preformed, pre-finished, mechanically-seamed, single length roof

pans, concealed attachment cleats and other components required for specific project conditions. Sheet steel shall conform to ASTM A792.

2. Formed pre-finished sheet metal flashing, trim, roof drainage systems, curbs, soffit system, etc. to withstand wind loads, structural movement, thermal movement, and exposure to weather without failing, rattling, leaking, fastener disengagement or allowing water infiltration to building interior. Comply with recommendations in FMG Loss Prevention Data Sheet 1-49:

3. Manufacturer is responsible for providing evidence acceptable to Architect that Manufacturer's specified roof system is capable of meeting thermal, wind uplift and performance requirements specified and as required by all local codes and 2021 International Building Code.

B. Thermal Movement:

1. Completed sheet metal system shall be capable of withstanding expansion and contraction of components cause by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

2. Interface between sheet metal component panels and concealed expansion clip shall provide for applicable thermal movement in each direction along the longitudinal direction.

3. Location and sizes of metal roofing rigid connectors shall be project specific as indicated an Engineer's (registered in the State of Alabama) certification and located on shop drawings.

4. Temperature Change Range: 120 degrees F ambient; 180 degrees F material surfaces.

C. Uniform Wind Load Capacity:

1. Design Loads (Roof Panels and Clips): Pressures are normal to roof surface in accordance with ANSI A58.1. Where load tests are required to certify performance, factor of safety shall be 2.5 on panel buckling or on clip-to-panel connections. For Wind Loads, an allowable increase factor of 4/3 may be employed (this results in net factors of safety of 1.875 on panel bending or clip failure from wind loads). Factor of safety for panel capacity of Live Loads shall be 2.0. Minimum wind speed 140 mph.

2. Roof Panel Clip Requirements: Connection of panel anchor clips to substructure or roof deck system shall be designed to resist loads developed by pressures with proper regard for prying forces and/or bending due to eccentric loading. Performance shall be evaluated at extreme positions of thermal movement. A 1/3 increase in allowable load is permitted for wind pressures. Allowable stresses for design shall be in accordance with specifications in AISI "Cold Formed Steel Design Manual", factor of safety on testing of connections shall be 2.5. Clips shall be double anchored through the deck to prevent rotation.

3. Installed roof system shall carry positive uniform design loads with maximum system deflection of L/180 as measured at rib (web) of panel. Comply with UL 580 / Uplift Rating UL 90. Minimum wind speed 140 mph.

D. Performance Requirements:

1. Underwriter's Laboratories, Inc., (UL), Wind Uplift Resistance Classification For Roof Assembly shall be Class 90, as installed, pursuant to Construction Number 312, 312 with batt insulation, 335, 335-modified, or 403, as defined by UL 580. Certified statements from manufacturer without proper UL Classification will not be acceptable.

2. Completed metal roof system shall have maximum static pressure air infiltration of 0.066 cfm/square feet of roof area with 6.24 psf air pressure differential when tested in accordance with ASTM E283.

3. No uncontrolled water penetration (dynamic pressure), other than condensation, when exposed to dynamic rain at 6.24 psf differential static pressure for not less than five minutes duration, when tested in accordance with ASTM E 1646

4. Calculated pull-out capacities for fasteners shall be certified by registered professional Engineer in the State of Alabama as selected by Owner. Minimum safety factor for anchoring fasteners into metal shall be 2.35. Minimum safety factor for anchoring fasteners into concrete shall be 4.0.

5. Installation shall comply with requirements of: FM I-90, FM Fire/windstorm Classification 1A-90 and FM Severe Hail and 2021 International Building Code Hail Impact and Windspeed. No exclusions for Hail under 2".

6. Entire roofing system and sheet metal assemblies are to be provided in detail for weathertightness under peak weather conditions.

E. 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.

1. This certification endorsement by the manufacturer shall assure the Owner/Architect that the materials supplied for this project are in compliance with materials and performances as specified in this section.

2. Field Inspector shall further stipulate by signing the certification that he has inspected the project as required and has found no unresolved issues with installation of the manufacturer's materials as supplied.

1.7 Submittals

A. Shop Drawings: Architectural details show design concept and relationship of roof and sheet metal system to other conditions. It is the responsibility of the Installer to prepare detailed shop drawings that adapt the indicated roof and sheet metal assemblies and configuration to conditions of this Project and specified requirements. Shop drawings shall be reviewed by manufacturer's Technical Department before submittal to Architect. Installer shall recommend and make any detail modifications required by manufacturer to ensure a proper and weathertight system.

1. Show roofing and sheet metal system with flashings and accessories in plan, elevation, sections and details for each type of product indicated.

2. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Also indicate attachment locations, thermal expansion provisions, and special supports. Submittal shall include manufacturer's written comments, all fastener descriptions and spacing, sealant description and locations, bend radii, metal thicknesses, dimensions of individual components and profiles, and other pertinent information.

3. Indicate relationships with adjacent and interfacing work.

4. Distinguish between factory and field assembly work.

5. Submit erection drawings showing proposed sequence of laying panels. Provide manufacturer's instructions for storage, handling and installation,

and their standard construction details for conditions on the Project.

6. Submit documentation that system attachment will meet UL-90 rating for resistance to wind uplift loads.

B. Product Data: Submit manufacturer's detailed material and system description, sealant and closure installation instructions, engineering performance data, and specifications.

C. Submit a sample 16 sq inch (min.) chip of each type of actual material color, complete with factory finish. Architect shall select from industry standard Energy Star Colors.

D. Quality Control Submittals:

1. Design Calculations:
   a. Submit design calculations sealed by registered Engineer in the State of Alabama indicating compliance with specified performance criteria and certified fastener pullout calculations. Indicate fastener types, spacings and number required for each clip. Pullout calculations shall be for panel clips.

   b. Empirical calculations for roof panel and clip-to-panel performance will not be accepted.

2. Test Reports:
   a. Submit reports from independent testing laboratory that bears stamp of Alabama registered Engineer (P.E.) to certify compliance with specified performance criteria.

   b. Each prequalified manufacturer shall provide complete and current data for specified roof system as follows:
      1) Thermal cycle testing of metal roof panels and panel clips as specified.
      2) Uniform ultimate wind uplift load capacity test for metal roof panels as specified.
      3) Ultimate pull-out capacity for panel clips, tested as specified.
      4) UL 90 Classification test data as specified.

5) Static air infiltration resistance test data as specified.
6) Water penetration test data as specified.
7) Fastener pull-out calculations as specified.

E. Submit a sample of Manufacturer's warranties.

1.8 Installer/Manufacturer Quality Assurance

A. Manufacturer: Company specializing in Architectural Sheet Metal Products with fifteen (15) years minimum experience. Being listed as prequalified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified for specific profile proposed.

B. Comply with SMACNA's "Architectural Sheet Metal Manual, 6th Edition." Any clarifications will be in accordance with this standard. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

C. No product substitutions shall be permitted without meeting specifications. Substitutions shall be submitted 10 days prior to bid date and acceptance put forth in an addendum. **No substitutions shall be made after the bid date**.

D. Installer shall be responsible for material and labor in the form of a single source contract. Split contracts are not acceptable.

E. Installer Qualifications:
1. Installer must be an Authorized Installer or Licensee, acceptable to roof system manufacturer for the complete finished sheet metal package. Manufacturer will determine initial acceptability of installer's qualifications for specified roof systems.

2. Installer's primary business must be the installation of roofing systems.

3. Installer must have minimum of five (5) years of experience installing preformed metal roofing systems.

4. Installer must have successfully completed minimum of five (5) significant installations of preformed metal roofing systems, including installation of long, field-formed panels. Submit complete description of each previous project, including name and phone numbers of representatives of the Owner, Architect, Manufacturer and Contractor.

5. Submit name and resume' of installer's proposed job superintendent, including list of similar projects completed by superintendent.

6. Installer must execute 100% of metal roof system installation with installer's own employees.

F. Pre-installation Conference: Conduct required coordination meetings / conferences to comply with requirements of this section and Division 1

G. Manufacturer's Twenty (20) Year Watertightness Warranty:
1. General Contractor shall send drawings to manufacturer for review before bid date to ascertain compliance of materials for accurate bidding purposes.

2. Installer, immediately upon award of bid, shall request application from manufacturer for manufacturer's Twenty (20) Year NDL or equivalent watertightness warranty.

3. Installer shall complete application forms and return to manufacturer with shop drawings for review and approval well in advance of installation date.

4. After completion of project, installer shall submit letter of certification from manufacturer that roof installation is in accordance with approved shop drawings and manufacturer's requirements, and that entire roof installation will be issued specified Twenty (20) Year watertightness warranty.

1.9 Delivery, Storage and Handling

A. Deliver pre-fabricated accessories to Project site in manufacturer's unopened containers.

B. Protect components during shipment, storage, handling and erection from mechanical abuse, stains, discoloration and corrosion.

C. Provide protective interleaving between contact areas of exposed surfaces to prevent abrasion during shipping storage and handling.

D. Store materials off ground, providing for drainage, under cover providing for air circulation, and protected from wind movement, foreign material contamination, mechanical damage, cement, lime or other corrosive substances.

E. Handle materials to prevent damage to surfaces, edges and ends of roofing sheets and sheet metal items. Damaged material shall be rejected and removed from site.

F. Protect from wind-related damage. Provide on-site storage, or other acceptable protection prior to installation.

G. Examine materials upon delivery. Reject and remove physically damaged, stained or marred material from Project site.

H. Panels with strippable film must not be stored in the open where exposed to the sun. Strippable film shall be removed only immediately before installation.

1.10 Site Conditions

A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for preformed metal roofing system.

B. Protection:

1. Provide protection or avoid traffic on completed roof surfaces.

2. Do not overload roof structure with stored materials.

3. Do not support roof-mounted equipment directly on roofing system.

C. Determine that work of other trades which penetrate roof or is to be made watertight by roof is in place and accepted prior to installation of roofing system. Actual roof penetration shall be located and provided under this section.

1.11 Scheduling

A. Coordinate staging and setup area required for field fabrication equipment provided by metal roofing manufacturer.

B. Provide temporary equipment (cranes, hoists, forklifts) as required.

1.12 Warranties

A. Provide Manufacturer's Premium NDL or manufacturer's equivalent Twenty (20) Year Weathertightness Roofing System Warranty fully executed, fully in force and dated within (30) days of project Substantial Completion. Sample warranty and outline of warranty program shall be submitted and approved prior to Pre-Installation Conference. NOTE: Entire source of material and labor shall be the sole responsibility of one Subcontractor. Split contracts are not acceptable. Warranty shall state:

1. Warranty shall be limited to the value of the installed roof assembly, signed by manufacturer of primary roofing materials and his authorized installer, agreeing to replace/repair defective materials and workmanship as required to maintain roofing system in watertight condition with No Dollar Limit (NDL).

2. Warranty shall not exclude any conditions such as flashing, interior gutters, curbs, penetrations, etc., which are an integral part of the roofing system.

3. Warranty shall include manufacturer approval of shop drawings and at least two (2) job site technical inspections by the manufacturer's field representative.

4. **All warranties shall contain language acknowledging the governing laws shall be according to the laws of the State of Alabama. Manufacturer's roofing guarantees (or warranties) which contain language regarding the governing of the guarantee (or warranty) by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees (or warranties).**

B. Provide Manufacturer's Premium (20) year Sheet Metal Finish Warranty stating:

1. Architectural coating finish will be Free of fading or color change in excess of 2 NBS units as measured per ASTM D 2244-68.

2. Architectural coating finish will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D 659-74.

3. Architectural coating finish will not peel, crack, chip or exhibit any other mechanical failure of paint to adhere to the substrate.

C. Furnish General Contractor's Five (5) Year Roofing Warranty in compliance with State of Alabama General Roofing Guarantee. All sheet metal flashings, trim and components provided under this section shall be covered under the State of Alabama General Contractor's Roofing Warranty.

D. The Subcontractor shall guarantee in writing all sheet metal roofing work and flashings to remain free from leaks, loosening, excessive buckling, failure to stay in place, and similar defects of materials and workmanship for a period of five (5) years from the date of acceptance of the work.

E. 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 Architectural Standing Seam Metal Roofing System

A. Panels shall be pre-finished factory formed 16" wide with 2" high vertical ribs and intermediate symmetrical striations. Vertical side ribs shall be provided continuous to lap, seal and interconnect with adjoining adjacent panels by means of mechanical seaming.

B. Attachment shall be provided by means of double fastened concealed clips at side laps to allow free thermal movement of roof panels over structure within regional temperature ranges.

C. Provide all accessories as required for a complete weathertight system to meet UL I-90 ratings including, but not limited to: clips, cleats, pressure plates and sealant tape. Attachment shall be provided to withstand negative loading.

D. Comply with ASTM E 1514

E. Panels shall be continuous full length, no end laps.

F. Exposed fasteners are not acceptable at eaves, valleys, or anywhere else contiguous to concealed fastener standing seam systems.

G. Substitutions shall fully comply with specified requirements and will be considered by submittal ten (10) days prior to bid date with applicable technical information and sample watertightness warranty.

H. Concealed Continuous Inner Rib:

1. Standing seam metal roof shall be fastened to framing members with concealed anchorage.

2. Concealed anchorage shall accommodate panel movement in each direction longitudinally to adequately accommodate temperature differential and panel movement for this Project.

3. Manufacturer shall design fastener device and spacing of fasteners to maintain required wind uplift resistance at connection.

I. Closures:
Ridge and hip closures shall be factory fabricated from 24 gauge sheet metal matching roof panels. Hip closures shall be field cut. Ridge closures are to be die-formed to match panel configuration.

J. Approved Manufacturers: AIM, Inc. - Architectural Integrated Metals, Inc., MBCI Morin, ACI Metal Roofing Systems, and Peterson Aluminum (Pac Clad) providing that products meet or exceed these specifications. Other Manufacturers must submit product information in compliance with Section 01360 at least 10 days prior to bid. Other approved manufacturers will be included in Addendum.

2.2 Underlayment

A. Self-Adhering, Elastomeric Sheet: 30 to 40 mils thick minimum, asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer according to application. After installation of underlayment there should be a Maximum exposure of 60 days regardless if manufacturer's product allows for extended exposure.

2.3 Rigid Roof Insulation

A. Provide a 1 " thick layer of polyisocyanurate rigid roof insulation over structural deck system. Stagger joints. Attach as recommended by manufacturer to comply with FM 1-90 and 120 mph wind speed and wind uplift requirements.

2.4 Roof Drainage Accessories

A. Gutters: Fabricate from pre-finished 24 gauge metallic-coated steel to profile indicated, complete with sealed / profiled end pieces, sealed outlet tubes, and other accessories as required. Fabricate in minimum 120-inch- long sections.

1. Gutter Straps: fabricated from 16-gauge galvanized steel, 1 ¼" width, spaced at 30" centers.

2. Gutter Accessories: Fabricate expansion-joint covers, outlet tubes, ends and other gutter accessories from same metal as gutters.

3. Gutter Style: As Indicated on Drawings

4. Expansion Joints: 50 feet o.c. maximum

B. Downspouts: Provide sealed outlet tube at connection to gutter. Fabricate rectangular downspouts from pre-finished 24 gauge metallic-coated steel complete with mitered elbows. Furnish with anchored metal hangers, formed from same material as downspouts.

1. Hangers: Hemmed edges 1 ¼ inch width.

2. Provide one precast concrete splash block or downspout boot as indicated with each downspout.

2.5 Soffit System:

A. General: Factory formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using a system of concealed fasters. Provide all accessories required for a complete and finished installation with continuous "J" closure at soffit panel ends and at perimeter of openings.

B. Aluminum Sheet Material: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operation and structural performances required.

1. Thickness: .032 inch nominal thickness

2. Surface: Smooth, flat finish

3. Exterior finish: Pre-painted Kynar 500 or approved equal

4. Color: To be selected by the Architect

C. Soffit Panels

1. Type: Perforated full vent panels at low eaves and non-perforated at rake eaves

2. Interlocking edges

3. Orientation: Span perpendicular to building face

D. Flashing and Trim: Provide Manufacturer's standard flashing and trim profiles, factory formed with color and finish to match soffit panels

E. Acceptable Manufacture's / Products: Pac-Clad 850

2.6 Sheet Materials

A. Finished steel sheet material shall be 24 gauge Pre-finished Galvalume (Aluminum-zinc alloy-coated steel – "Hot Dipped Process") per ASTM A792/A792M-97a

B. Unfinished steel sheet metal materials shall be Galvalume ASTM 792-86, AZ 55, "Satin Finish.

C. Finished materials shall be provided with 70% Kynar 500 Fluorocarbon coating, applied by the manufacturer on a Continuous Coil Coating Line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility and longevity as specified by the Kynar 500 finish supplier. Color as selected by Architect.

D. Removable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film shall be removed immediately before installation.

E. Soffit System Material: Aluminum Sheet Coil-coated sheet, ASTM B 209, alloy, 032 inch nominal thickness with temper as required to suit forming operation and structural performances required. Note: only the soffit system shall be of aluminum materials.

2.7 Accessory Materials

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners:

1. Concealed fasteners for standing seam roofing system shall be 300 series alloy stainless steel pancake head, size and spacing per manufacturer's recommendation for installation over rigid insulation/metal deck, to attach to 24 gauge clips spaced per manufacturer's recommendation to comply with FM1-90/ 120 mph wind speed.

2. Miscellaneous fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

a. Exposed Fasteners: Heads matching color of sheet metal by means factory-applied coating.

b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex head washer gasket.

c. Blind Fasteners: Exposed rivets shall be self-plugging type minimum 3/16" diameter 300 series alloy high-strength stainless-steel with stainless-steel stems.

d. Exposed Rivets:
Exposed rivets shall be self-plugging type minimum 3/16" diameter 300 series alloy stainless steel with stainless steel stems.

C. Sealants:

1. Standing Seam Sealant: Factory applied extruded vinyl weather seal.

2. Flashing Sealant: shall be approved equal to Tremco Spectrum 1.

3. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

4. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

5. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.8 Fabrication

A. Preformed Roofing Metal Panels:

1. Prefinished 24 gauge, Grade C G-90 galvanized steel panel shall conform to ASTM A446 within acceptable tolerances of ASTM A525 of continuous field formed full lengths.

2. Panels shall have minimum 2" vertical rib height, spaced at 16" o.c.

3. Panels shall be designed as true standing seam shape, requiring no trapezoidal foam closures, plugs or fillers at eaves.

4. Standing seams shall mechanically interlock with concealed anchorage to prevent entrance or passage of water.

5. Seams shall allow anchorage to resist negative loading and allow expansion and contraction of panels due to thermal changes.

6. Integral snap seams which are not mechanically seamed are not acceptable.

7. Standing seams shall contain a factory applied Extruded Vinyl Weather Seal with the continuous inner rib system to prevent siphoning of moisture

through the sidejoint seam (vinyl not available with intermittent clip system).

8. Panels shall be fabricated in continuous lengths as required. No horizontal endlap joints shall be permitted in roof panel lengths. Panels shall be full length from peak to eave as indicated.
9. Transverse or endlap seams will not be permitted.

10. Design panels to use concealed fasteners. Exposed fasteners in roofing pans will not be permitted.

11. Standing seam must prevent water capillary action, or otherwise prevent water infiltration.

12. Examine panels as they are formed to ensure panels are being formed within acceptable tolerances.

B. Flashing and Trim:

1. General: Custom / Shop fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of work indicated. Field verify measurements for accurate fit before shop fabrication.

2. Fabricate roofing and related sheet metal work in accordance with accepted shop drawings, manufacturer's recommendations and applicable standards.

3. Provide flashings in minimum 10'-0" sections except as otherwise noted. Form flashing using single pieces for full width. Provide shop fabricated, mitered and joined corners.

4. All exposed adjacent flashing, ridge, and valleys shall be of the same material and finish as the roof panels.

5. All flashings, hem exposed edges on underside 1/4 inch.

6. All roof penetrations shall be flashed by Metal Roofing Contractor/Installer. All circular roof penetrations shall be made of a one piece construction from an EPDM membrane with aluminum base. Roof curbs shall be furnished by Mechanical Contractor and upon acceptance, installed by Roofing Contractor/Installer.

7. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that indicated for each application.

8. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks with exposed edges folded back to form hems.

9. Sheet Metal Accessory Seams: Fabricate nonmoving seams for accessories with soldered flat-lock seams.

10. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

11. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

12. Conceal fasteners and expansion provisions where possible on exposed sheet metal flashing and trim,

13. Concealed cleats: galvanized 20-gauge

14. Equipment support flashing, expansion joint covers, counterflashing, flashing receivers, eave and rake flashing: pre-finished 24-gauge

3.0 - EXECUTION

3.1 Inspection

A. Examine alignment, attachment and placement of building roof structure and substrates before proceeding with installation of preformed metal materials. Substrate to be within 1/4" to true in 20 feet.

B. Examine roof deck before starting installation. Deck must be clear, clean and smooth, free of depressions, waves or projections, dry and must remain dry and free of ice and snow, after roofing application commences.

C. Structural support such as diagonal bracing and connections shall be tightened in place before work can proceed.

D. Field check dimensions and check support alignment with taut string or wire. Support misalignment will cause panel to oil can.

E. Do not proceed with installation until conditions are satisfactory. Notify Architect in writing of unsatisfactory conditions. Commencement of installation of the metal panels indicates acceptance of all roof structure conditions.

3.2 Installation

A. General Installation Requirements:

1. Install roofing and flashings in accordance with accepted shop drawings and manufacturer's product data, within specified tolerances. Minimum standards shall be as established by Sheet Metal & Air Conditioning Contractors' National Association, Inc. (SMACNA) and National Roofing Contractors Association (NRCA).

2. Separate dissimilar metals and masonry or concrete from metals with bituminous coating. Use fasteners with gasket where required to prevent corrosive action between fastener, substrate and panels.

3. Limit exposed fasteners to extent indicated on shop drawings.

4. Anchorage shall allow for temperature expansion and contraction movement without stress or elongation of panels, clips or anchors. Attach clips to structural substrate using fasteners of size and spacing as

determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.

5. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with manufacturer's recommendations, accepted shop drawings and applicable standards.

6. Torch cutting or cutting with abrasive tools of sheet metal including roofing, flashing and trim is not permitted.

7. Bed flanges in coating of elastomeric sealant where required for waterproof performance.

8. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal..

9. Install sheet metal flashing and trim in strait line and level indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

10. Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

11. Underlayment: Where installing metal flashing directly on substrates, install a slip sheet of elastomeric underlayment. After installation, underlayment shall not be exposed in excess of 60 days.

B. Preformed Standing Seam Metal Roof Panels:

1. Fasten concealed anchorage with fasteners as recommenced by manufacturer and at spacings as required for wind uplift.

2. Verify with manufacturer locations of fixed connections and expansion connections.

3. Install starter and edge trim before installing roof panels.

4. Remove protective strippable film immediately prior to installation of roof panels.

5. Install panels to either Continuous Rib or Clips per manufacturer's details.

6. Seam Panel sidelaps using power-driven Seamer as recommended by manufacturer to ensure watertightness.

7. Erect metal roofing with lines, planes, rises and angles sharp and true, and plane surfaces free from objectionable wave, warp, dents, buckle or other physical defects with minimum oil canning.

8. Do not allow traffic on completed roof. If required, provide cushioned walk boards.

9. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.

10. Remove and replace any panels or components which are damaged beyond successful repair.

C. Flashing:

1. Provide fascias, soffits, vents and/or coping to shape indicated and/or recommendations for installation of work where not specifically detailed in shop drawings. Set sheet metal items level, strait lined and plumb.

2. Provide concealed fasteners and provisions for expansion wherever possible.

3. Fold back edges of concealed side of exposed edge to form ½" hem.

4. Secure to wood with screws.

5. Seal flashing and trim joints with elastomeric sealant as required for watertight construction.

6. Reglet Flashing: Saw-cut reglets a minimum of one (1") inch deep by one quarter (¼") inch wide into masonry substrate/wall and Insert metal flashings into reglets, anchor with fasteners and wedges and seal joints thoroughly.

7. 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.

8. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten

9. Provide breakaway type expansion joint system as indicated above 4 hour walls of same material and finish as roof panels.

10. Set metal already partly formed in place and fasten by means of cleats. Use cleats to keep laps closed when face width exceeds 8".

D. Roof Drainage and Accessories:

1. General: Provide gutters, down pipes and scuppers to shapes indicated and/or required. Systems shall include all items sized as necessary to carry off water to splash blocks or into boots. Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

2. Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps maximum 30 inches on center. Provide end closures and seal watertight with sealant. Slope to downspouts.

a. Front top elevation of gutter shall be installed minimum 1" below front top elevation of low point roof edge attached with loosely lock straps to front gutter bend and anchor to roof edge.

b. Install gutter with joints not exceeding 50 feet on center to allow for linear expansion with expansion joint caps.

3. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fastener straps designed to hold downspouts securely 1 inch away from walls; locate fastener straps at top and bottom and between approximately 48" inches o.c.
   a. Provide elbows at base of downspout to direct water away from building.

   b. Connect downspouts to underground drainage system where indicated with transition fittings.

4. Expansion-Joint Covers: Install expansion-joint covers where indicated or required to adhere with profiles indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

5. Down pipe straps shall be 20 gauge metal hangers, 1-1/2" wide anchored into wall each side of down pipe. Straps shall be minimum 8'-0" apart with minimum two per pipe.

6. Provide prefabricated downspout outlet tubes at gutter/downspout intersection for attachment. Seal thoroughly.

7. Provide prefinished rain water diverters at all valley/gutter intersections.

E. Soffit System:

1. General: Install Pre-finished Aluminum Soffit System according to Manufacturers standard instruction to thoroughly eliminate gaps, openings and adhere to design intentions as indicated on the drawings.
   a. Span soffit panels perpendicular to building face

   b. Attach to prevent wind damage and allow thermal movement with color matching fasteners.

   c. Install to conceal cut edges

   d. Touch-up as required to match exposed finish

3.3 Field Quality Control

A. Tolerances:

1. Applicable erection tolerances: Maximum variation from true planes or lines shall be 1/4" in 20'-0", 3/8" in 40'-0" or more.

2. Roof structure and roof system are designed for minimum roof slope of 1/2:12 (refer to roof plans for areas and slope).

B. Manufacturer's Twenty (20) Year Weathertightness Warranty Field Inspections:
1. The manufacturer's factory technician shall inspect the installer's work during the course of the metal roof construction:

a. First, upon completion of underlayment and trim installation and prior to panel installation.

b. Second, at the conclusion of the panel installation.

2. The factory technician is to review all details with the Subcontractor's designated superintendent for conformance to the approved shop drawings and the requirements of the weathertightness warranty. Any corrections shall be the responsibility of the installer.

C. Damaged or deteriorated sheet metal material beyond minor repair, shall be subject to rejection and replacement as determined by the Architect.

D. Touch-up exposed fasteners using paint furnished by roofing panel manufacturer and matching exposed panel surface finish.

3.4 Cleaning

A. Clean roof in accordance with manufacturer's recommendations.

B. Clean exposed surfaces immediately upon installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, pieces of flashing and temporary protective film materials. Maintain in a clean condition during construction. Leave and maintain in clean condition. Touch up minor abrasions and scratches in finish per manufacturer's recommendations with touch-up paint supplied by manufacturer.

E. To prevent rust staining and scratches on finished surfaces, immediately remove fillings produced by drilling or cutting.

F. Promptly remove all scrap and construction debris from the site.

3.5 Final Inspection

A. Final inspection will be performed by the Architect with Department of Construction Management Inspector. Schedule with the Architect Three (3) weeks in advance.

B. Fully executed roof warranties must be presented at time of Final Inspection.

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 2021 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 2021 IBC.

Roofing Material Manufacturer's Inspector: _____

Signature Printed Name

1.0 - GENERAL

1.1 Scope
The work under this section consists of thru-wall flashing.

1.2 Submittals
Submit for approval all materials proposed for use under this section.

2.0 - PRODUCTS

2.1 Flashing (Masonry)
Flashing shall be Polyvinyl Chloride, 30 mil (.030") waterproof sheeting equal to Wire-Bond or other pre-approved product.

Flashing (Non-Masonry)
Flashing shall be a self-adhering flexible membrane consisting of Elvaloy thermoplastic resin with the following physical properties:

Tensile Strength: 2000 psi per ASTM D412
Ultimate Elongation: 25 percent
Shore A Hardness: 83 per ASTM D 2240
Corners and End Dams; preformed shapes

Acceptable Manufacturers:
Flex Flash – as manufacture by Hohmann & Barnard, Inc. or pre-approved equal.

Surface Adhered Membrane with Drip – as manufactured by Hyload Flashings

DuPont Thru-Wall Flashings – as manufactured by DuPont Chemical Co.

2.2 Adhesive & Primers
Adhesive & primers for bonding and splicing shall be as recommended by the manufacturer of the material used.

3.0 - EXECUTION

3.1 Extent
Wall flashing shall generally be installed continuous at each floor level, over exterior wall openings, under sills, and at other locations as indicated and as required.

3.2 Installation

A. All surfaces to receive the flashing shall be reasonably smooth, free from irregularities and primed as recommended by manufacturers installation instructions. On all masonry surfaces, the flashing shall be laid continuously in a fresh bed of mortar above and below. Only at non-masonry vertical surfaces shall flashing be affixed continuously with adhesive and term bar to hold flashing in place.

B. At grade level floors, thru-wall flashing shall exit finish veneer minimum one course below finish floor and below weep holes.

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

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, Republic 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 galvannealed 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. Galvannealed doors: include Galvannealed hardware reinforcements. Include Galvannealed components and internal reinforcements with Galvannealed doors. Close tops of exterior swing-out doors to eliminate moisture penetration. Galvannealed 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.

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 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. Electrical Requirements for Frames:

1. 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. Labeling of Fire Doors and Frames

All door openings in fire resistive walls and partitions requiring a rating shall be protected by assemblies which include doors, frames, hardware, closing devices, anchorage, sills, etc., installed in accordance with the National Fire Protection Association (NFPA) 80, Standard for "Fire Doors and Fire Windows" and the State Building Code.

To further clarify the basic requirements and the correct method of labeling that will be acceptable to the Division of Construction Management, the labels shall include the following:

a. Accessibility: Each component shall bear a label located to be accessible after installation.

b. Permanence: Each component shall bear a 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. Labels shall be raised or embossed on metal labels or stamped into metal frames. Plastic or paper labels are unacceptable.

c. Legibility: The label design shall be such that it can always be visible and legible and must be clean of any paint or other coverage making the label illegible.

d. Fire Resistance: All approved labels on doors and on frames shall include thereon the fire resistance rating in hours and minutes for which the door or frame is labeled. Labels on frames with transoms or sidelights must identify that the opening assembly includes same.

e. Other Requirements: The labels or stamps applied to frames must be provided by a manufacturer that has been approved by a laboratory or organization to provide testing and follow-up

services for fire-rated opening assemblies.

2. 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. **BITUMINOUS COATING IS TO BE FIELD APPLIED TO THE INSIDE OF FRAMES THAT ARE TO BE INSTALLED IN MASONRY, OR TO BE GROUTED, 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

PART 1 1.0 - GENERAL

1.1 Section Includes
A. Overhead coiling insulated doors.

1.2 Related Sections
A. Section 05500 - Metal Fabrications: Support framing and framed opening.

B. Section 06210 - Finish Carpentry: Wood jamb and head trim.

C. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

D. Section 09910 - Painting: Field applied finish.

E. Section 16000 - Raceway and Boxes: Conduit from electric circuit to door operator and from door operator to control station.

F. Section 16000- Wiring Connections: Power to disconnect.

1.3 References
A. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.

B. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.

C. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

D. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

F. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

G. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. NEMA MG 1 - Motors and Generators.

1.4 Design / Performance Requirements
A. Overhead coiling insulated doors:

1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components in conformance with ASTM E 330.

2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.5 Submittals

A. Submit under provisions of Section 01350.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Details of construction and fabrication.

4. Installation instructions.

C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 Quality Assurance

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years of experience in the fabrication and installation of security closures.

B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.7 Delivery, Storage, And Handling

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 Project Conditions

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 Coordination

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 Warranty

A. Warranty: Manufacturer's limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

B. Warranty: Manufacturer's limited door warranty for 2 years for all parts and components.

2.0 – PRODUCTS

2.1 Manufacturers

A. Acceptable Manufacturer: Overhead Door Corp. Stormlite Series 625 or pre-approved equal

B. Requests for substitutions will be considered in accordance with provisions of Section 01360.

2.2 Insulated Overhead Coiling Service Doors

A. Insulated Service Doors:

1. Curtain: Interlocking roll-formed slats as specified following.
   a. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
   b. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.
   c. Front slat fabricated of:24 gauge galvanized steel.
   d. Back slat fabricated of: 24 gauge galvanized steel.
   e. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.
   f. R-Value: 7.7, U-Value: 0.13.
   g. Sound Rating: STC-21.

B. Performance:

1. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.

U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.

Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage <1.00 cfm/ft2.

C. Finish:
Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.

1. Powderguard Premium power coat. Color to be selected by Architect from manufacturer's full line of colors.

D. Weatherseals:
Vinyl bottom seal, exterior guide and internal hood seals.

1. Interior guide weatherseal.

2. Lintel weatherseal.

E. Bottom Bar:
Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.
Finish: PowderGuard Weathered finish with iron/black powder.

F. Brackets:
Galvanized steel to support counterbalance, curtain and hood.

G. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

H. Hood: Provide with internal hood baffle weatherseal.
24 gauge galvanized steel with intermediate supports as required.

I. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.

1. Sensing Edge Protection:

J. Operator Controls:
Push-button and key operated control stations with open, close, and stop buttons.

K. Controls for interior location. – Push Button
Controls for exterior location.- Key
Controls for both interior and exterior location.

1. Controls surface mounted.

L. Special Operation:
Explosion and dust ignition proof control wiring.
Motor Voltage: 115/230 single phase, 60 Hz.

M. Windload Design:
Standard windload shall be 20 PSF.

N. Locking:
Cylinder lock for electric operation with interlock switch.

O. Wall Mounting Condition:
Face-of-wall mounting.

3.0 – EXECUTION

3.1 Examination

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 Preparation

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 Installation

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 16000. Complete wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07910.

G. Install perimeter trim and closures.

H. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.4 Adjusting

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

3.4 Adjusting

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 Cleaning

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 Protection

A. Protect installed products until completion of project.

END OF SECTION

1.0 - GENERAL

1.1 Work Included

A. Furnish and install aluminum architectural windows complete with hardware and all related components as shown on drawings and specified in this section.

B. All windows shall be Winco (3600) HS-AW/80 as Basis of Design.

C. Other manufacturers requesting approval to bid their product as an equal must submit the following information at least ten days prior to bid date
   1. Detail cuts and product data.
   2. Test reports documenting compliance with requirements this section.
   3. Approved products shall be notified in writing via Addendum.

D. Glass and Glazing
   1. All units shall be factory glazed.

1.2 Related Work

A. Section 08400 - Entrance and Storefronts

B. Section 08800 – Glass and Glazing

C. Section 07900 - Caulking and Sealants

1.3 Testing and Performance Requirements

A. Test Units
   1. Air, water, and structural test unit shall conform to requirements set forth in ANSI/AAMA/NWWDA 101/I.S.2-97.

B. Test Procedures and Performances
   1. All windows shall conform to ANSI/AAMA/NWWDA 101/I.S.2-97requirements for referenced window type in section 1.01B. in addition, the following specific performance requirements shall be meet.
   2. Air Infiltration Test
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 283 at static air pressure of 6.24 psf.
      b. Air infiltration shall not exceed .3 cfm per square foot.
   3. Water Resistance Test
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 331 at static pressure difference of 12 psf.
      b. There shall be no uncontrolled water leakage.
   4. Uniform Load Deflection Test
      a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference (positive and negative) of 75.0psf.

b. During the course of the test, no member shall deflect more than 1/175 of its span.

5. Uniform Load Structural Test
   a. With window sash and ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 75 psf.

   b. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage, which would cause the window to be inoperable.

6. Condensation Resistance Test (CRF)
   a. With window sash closed and locked, test unit in accordance with AAMA 1503.1.

   b. Condensation Resistance Factor (CRF) shall not be less than____.

7. Thermal Transmittance Test (Conductive U-Value)
   a. With window sash closed and locked, test unit in accordance with AAMA 1503.1.

   b. Conductive thermal transmittance (U-Value) shall not be more than .59 BTU/hr/sf/per degrees F.

8. Life Cycle Test
   a. Tested in accordance with AAMA 910, there shall be no damage to fasteners, parts, support arms, activating mechanisms, or any other damage which would make the window inoperable. Subsequent air infiltration and water resistance tests shall not exceed specified requirements.

1.4 Quality Assurance

A. Provide test reports from AAMA accredited laboratory certifying the performance as specified in Section 1.05.

B. Test reports shall be accompanied by the window manufacturer's letter of certification stating that the tested window meets or exceeds the afore mentioned criteria for the appropriate ANSI/AAMA/NWWDA 101/I.S.2-97.

1.5 Submittals

A. Contractor or window manufacturer shall submit shop drawings, finish samples, test reports, and warranties, per requirements of architect.
   1. Shop Drawings: Include typical unit elevations, full- or half-scaled detail sections and typical installation details. Include type of glazing, screening, and window finish.

   2. Product Data: Manufacturer's specifications, recommendations and standard details for window units.

   3. Samples of materials may be requested without cost to owner, i.e. frame sections, corner samples, mullions, extrusions, anchors, and glass.

1.6 Delivery, Storage, and Handling

A. Store and handle windows and other components in strict compliance with

manufacturer's instructions.

B. Protect units against damage from the elements, construction activities and other hazards before, during, and after installation.

1.7 Warranties

A. Total Window System

1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total window installation, which includes that of the windows, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc. as it relates to air, water and structural adequacy as called for in the specifications and approved shop drawings.

2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at his expense during the warranty period.

2.0 - PRODUCTS

2.1 Materials

A. Aluminum

1. Extruded aluminum shall be 6063-T6 alloy and tempered, with a tensile strength of 24,000 PSI.

B. Hardware

1. Extruded aluminum auto-spring catch shall be provided at the jamb of the operating sash.

2. All operating roller assemblies shall consist of steel ball bearing rollers and pin in a heavy nylon housing.

C. Weatherstrip

1. Each vent shall have one row of heavy fin seal wool pile weatherstripping and one row of ridged vinyl installed in specially designed weather strip pocket in the extrusion.

D. Thermal Barrier:

1. Poured-in-place structural thermal barrier shall transfer shear during bending and provide composite action between frame components.

2. Thermal barrier pocket on aluminum extrusions shall be Azo-Braded to create a mechanical lock to improve the adhesion properties between the polyurethane polymer and the surface of the thermal barrier pocket.

3. Window manufacturer must provide a warranty from the manufacturer of the polyurethane thermal barrier that warrants against product failure as a result of thermal shrinkage beyond 1/8 inch (3.2 mm) from each end and fracturing of the polyurethane for a period not to exceed ten years from the date of window manufacture.

4. Thermal barrier's made of crimped in place polyamide (insulbar®) strips are not acceptable unless all strips are covered and tooled with Dow 795 silicone caulking to eliminate water migration.

E. Glass

1. Insulated glass shall be 1" insulated. See Glass and Glazing Section 08810.

F. General

1. Mechanical fasteners and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and vent corners.

G. Frame

1. All aluminum frame extrusions shall have a minimum wall thickness of .062.

2. Main frame sill members shall have a minimum wall thickness of .080.

3. The main frame depth shall not be less then 3-1/4"

4. Frame components shall be assembled by means of mechanical fasting with screws. Joinery to be sealed with small joint sealant.

H. Ventilator

1. All sash frame extrusions shall have a minimum wall thickness of .062.

2. Depth of the vent frame shall be not less then 1-3/8".

3. Each corner shall be assembled by means of mechanical fasting with screws. Joinery is sealed with small joint sealant.

4. Each vent shall have one row of heavy fin seal wool pile weather-stripping and one row of ridged vinyl installed in specially designed weather strip pocket in the extrusion.

I. Screens (Applicable only to windows requiring screens)

1. Extruded screen frames shall be fabricated from aluminum 6063-T6.
   a. Screen mounting holes shall be pre-drilled at the factory.
   b. Screen mesh shall be (enter aluminum, fiberglass, or stainless steel).
   c. Screen mesh shall be so installed that the cloth may be easily replaceable.

J. Glazing

1. All units shall be glazed with hot melt, silicone on the exterior, with glazing vinyl and extruded snap-in aluminum glazing bead on the interior.

K. Finish

Painted - Finish all exposed areas of aluminum windows and components with (70% Kynar) AA-M12-C42-R1X & AAMA 2605-98 & ASCA 96. Color is to be selected by Architect.

3.0 – EXECUTION

3.1 Inspection

A. Job Conditions

1. Verify that openings are dimensionally correct and within allowable tolerances. Openings must be plumb, level, and clean. Provide a solid anchoring surface that is in accordance with approved shop drawings.

3.2 Installation

A. Use only skilled craftsmen for work to be done in accordance with approved shop drawings and specifications.

B. Set square and level aligning window faces in a single plane for each opening. Windows and materials must be set square and level. Adequately anchor window so when subjected to normal thermal movement, specified building movement, and specified wind loads, so windows will maintain a permanent position.

C. Adjust Windows for proper ease of operation after installation has been completed.

D. Contractor furnish and apply sealant, per manufacturers recommendations, to provide a weather tight installation at all opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.

3.3 Protection and Cleaning

A. After completion of window installation, windows shall be inspected, adjusted, and left in working order. Windows shall be left clean, free of labels, dirt, etc. Protection from this point shall be the responsibility of the building occupant.

END OF SECTION

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. Architectural Hinges
2. Continuous Hinges
3. Key Control System, Cylinders and Cores.
4. Locksets, Latchsets and Deadbolts
5. Panic Devices and Fire Rated Exit Devices
6. Closers and Door Control Devices
7. Overhead Door Stops and Holders
8. Floor and Wall Stops
9. Door Bolts and Coordinators
10. Door Pulls, Push/Pull Plates and Push/Pull Sets
11. Protective Plates
12. Door Seals, Gasketing and Weatherstripping
13. Thresholds
14. Miscellaneous Door Control Devices
15. Electromechanical Hardware
16. Miscellaneous Access Control Components and Security Equipment

C. Related Sections: The following Sections contain requirements that relate to the following sections.
1. Section 08110: Hollow Metal Doors and Frames
2. Section 08215: Wood Doors
3. Division 16: Electrical
4. Division 28: Electronic Safety and Security

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)
6. UL 10C - Fire Tests Door Assemblies
7. Warnock Hersey

B. Regulatory standards of the following as referenced:
1. Department of Justice, Office of the Attorney General, *Americans with Disabilities Act*, Public Law 101-336 (ADA).
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.
   j. Column 1: State specified item and manufacturer.
   k. Column 2: State prior approved substituted item and its manufacturer.
2. Furnish complete wiring diagrams, riser diagrams, elevation drawings and operational descriptions of electrical components and systems, listed by opening in the hardware submittals. Elevation drawings shall identify locations of the system components with respect to their placement in the door opening. Operational descriptions shall fully detail how each electrical component will function within the opening, including all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval. Supply a copy with delivery of hardware to the jobsite and another copy to the Owner at the time of project completion.
3. 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.
4. 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.
   2. General Contractor to set up and attend the following:
   3. Meet with the Owner, General Contractor, Supplier, electrical and security contractors to coordinate all electrical hardware items. Supplier to provide riser diagrams, elevation drawings, wiring diagrams and operational descriptions as required by the General and sub-contractors.

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 or 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.

F. Pre-Installation Coordination:
1. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years' experience in successful completion of projects similar in size and scope.
2. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
3. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware items, and any other effected subcontractors or suppliers.
4. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

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. Mortise Locks: Three Year Period
2. Door Closers: Thirty Year Period
3. Exit Devices: Three 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.

B. Parts kits: Furnish manufacturers' standard parts kits for locksets, exit devices, and door closers.

2.0 - PRODUCTS

2.1 Manufactured Units

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. Geared 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 ¾" 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 and Keying:
1. Acceptable manufacturers:
   a. Match existing keying system.
2. Characteristics:
   a. Existing System: Grandmaster key the locks to the Owner's existing system, with a new master key for the Project.
   b. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated

into Owner's existing system.

c. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

d. 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.

e. Permanently inscribe each key with number of locks that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE".

f. Key Material: Provide keys of nickel silver only.

g. Furnish the following Key Quantities:
   1) Three (3) change keys for each lock.
   2) Five (5) master keys for each master system.
   3) Five (5) grandmaster keys for each grandmaster system.
   4) Ten (10) construction master keys.
   5) Two (2) construction Control Keys.
   6) One (1) extra blank for each lock.

h. Furnish construction master keys to General Contractor.
   1) 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 Series
   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. Electric operation: Manufacturer-installed continuous duty solenoid.
      g. Strikes: 16 gage curved stainless steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
      h. Scheduled Lock Series and Design: Schlage L Series :
         1) **FIELD VERIFY AND MATCH EXISTING LEVER DESIGN.**
      i. Certifications:
         1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
         2) ANSI/ASTM F476-84 Grade 30 UL Listed.

E. Deadbolts: as scheduled.
   1. Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" dia. steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike with 1/8" thick strike reinforcement and two 3" long screws. ANSI A156.5, 1992 Grade 1 certified.

F. Exit Devices:
   1. Acceptable manufacturers:
      a. Von Duprin 98 Series*
      b. Sargent 8000 Series
      c. 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.

G. Closers and Door Control Devices:
1. Acceptable manufacturers:
a. LCN Closers 4010/4110 Series*
b. Norton 9500 Series
c. Corbin Russwin DC8000
2. Characteristics:
a. Door closers to have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.
b. 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.
c. 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.
d. 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.

e. Overhead concealed closers to have spring power adjustable for 50% increase in closing power and fully mortised door tracks.

f. All surface closers to be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. All closers (overhead, surface and concealed) to be of one manufacturer and carry manufacturer's ten year warranty (electric closers to have two year warranty).

g. 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.

h. 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.

i. 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.

H. Floor Stops and Wall Bumpers:
1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics: Refer to Hardware Headings.

I. Push Plates:
1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Exposed Fasteners: Provide manufacturers standard exposed fasteners.
   b. Material to be forged stainless steel, per the Hardware Headings.
   c. Provide plates sized as shown in Hardware Headings.

J. Door Pulls & Pull Plates:
1. Acceptable manufacturers:
   a. Ives*
   b. Trimco
   c. Rockwood Manufacturing
2. Characteristics:
   a. Provide concealed thru-bolted trim on back to back mounted pulls, but not for single units.
   b. Material to be forged stainless steel.
   c. Provide units sized as shown in Hardware Headings.

K. Push Pull Sets:
1. Acceptable manufacturers:
   a. Ives*

b. Trimco
c. Rockwood Manufacturing

2. Characteristics:
   a. Provide mounting systems as shown in hardware sets.
   b. Material to be tubular stainless steel.
   c. Provide Push/Pull sets sized as shown in Hardware Headings.

L. 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:
   c. Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
   d. 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.
   e. Sizes:
      1) Refer to hardware headings for specific sizes.
      2) Kick plates to be 8 inches in height.
      3) Mop plates to be 6 inches in height.
      4) Kick plates and Mop plates to be 1" less that bottom rail height where applicable.
      5) Armor plates to be 34 inches in height. Armor plates on fire doors to comply with NFPA 80.

M. Thresholds:
1. Acceptable manufacturers:
   a. Zero Weatherstripping Co., Inc.*
   b. Pemko
   c. Reese Industries
2. Types: Indicated in Hardware Headings.

N. Door Seals/Gasketing:
1. Acceptable manufacturers:
   a. Zero Weatherstripping Co., Inc.*
   b. Pemko
   c. Reese Industries
2. Types: Indicated in Hardware Headings.

O. Silencers:
1. Acceptable manufacturers:
   a. Ives*
   b. Hager
   c. Rockwood Manufacturing
2. Provide three for each single door; two for each pair of doors.

P. Key Cabinet and System:
1. Acceptable manufacturers:
   a. Telkee, Inc.
2. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for

the project.

3. Provide complete cross index system set up by key control distributor, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
4. Provide hinged-panel type cabinet for wall mounting.
5. Provide multiple-drawer type cabinet.

Q. Knox Box:
1. Acceptable manufacturers:
   a. Knox Box 3200 Series.
2. Provide one surface mount Knox Box 3200 Series.
3. Provide unit compatible with the local Fire Department Knox key system.
4. General contractor shall install in location provided by architect.

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. Use thru-bolts for installation of all exit devices, closers, and surface-mounted overhead stops. 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 provide sex nuts and bolts.

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.

F. FIELD VERIFY AND MATCH EXISTING HARDWARE FINISH.

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.

3.3 Hardware Schedule

HARDWARE SET: B01

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	STOREROOM LOCK	L9080	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	1461 SHCUSH TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: B03

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	CLASSROOM DEAD LOCK	L463T	SCH
1	CYL/CORE	AS REQUIRED	
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	OH STOP	100S	GLY
1	SURFACE CLOSER	4011 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	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8192AA	ZER
1	THRESHOLD	655A-MSLA-10	ZER

HARDWARE SET: B04

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	CORRIDOR LOCK	L9456 L583-363	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4011 MC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: B05

EACH TO HAVE:

4	HINGE	5BB1WT 5 X 7 NRP	IVE
1	TURN I/S DEAD LOCK	L480 L583-363	SCH
1	DOOR PULL	8102HD 8" STD (INTERIOR SIDE MOUNT)	IVE
1	WALL STOP/HOLDER	FS495	IVE
1	GASKETING	8144SBK PSA	ZER

*USE "TOP OF DOOR" MOUNTING OPTION FOR FS495 WALL STOP/HOLDER.

COORDINATE 180 DEGREE SWING/HOLD-OPEN WITH FRAME AND WALL CONDITION. ADJUST HINGE TYPE/SIZE AS REQUIRED.

HARDWARE SET: B08

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	PANIC HARDWARE	CD-98-NL-SNB	SCH
2	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4111 SHCUSH TBWMS	LCN
1	ARMOR PLATE	8400 32" X 2" LDW B-CS	IVE
1	FLOOR STOP	FS18S	IVE
1	RAIN DRIP	142AA	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: B09

EACH TO HAVE:

1	CONT. HINGE	224XY	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	4011 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: B10

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	CORRIDOR LOCK	L9456 L583-363	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	1461 SCUSH FC TBWMS	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	RAIN DRIP	142AA	ZER
1	GASKETING	8144SBK PSA	ZER
1	DOOR SWEEP	8198AA	ZER
1	THRESHOLD	65A-223	ZER

HARDWARE SET: F01

EACH TO HAVE:

1	CONT. HINGE	224XY	IVE
1	PUSH PLATE	8200 4" X 16"	IVE
1	PULL PLATE	8303 10" 4" X 16"	IVE
1	SURFACE CLOSER	4011 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
3	SILENCER	SR64	IVE

HARDWARE SET: G01

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	PRIVACY W/DEADBOLT	L9440 L583-363 L283-721	SCH
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
3	SILENCER	SR64	IVE

HARDWARE SET: G06

EACH TO HAVE:

1	HINGE	3CB1 4.5 X 4.5	IVE
2	SPRING HINGE	3SP1 4.5 X 4.5	IVE
1	DOOR BOLT OCC IND	B571	SCH
1	DOOR PULL	PR 8102HD 6" J	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

PROVIDE WALL STOP WHERE APPLICABLE. WHERE WALL STOP IS NOT APPLICABLE, ADJUST SPRING HINGES TO AVOID OVER SWINGING. INSTALL SPRING HINGES IN BOTTOM TWO HINGE PREPS.

HARDWARE SET: H01

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	ENTRY LOCK	L9050 L583-363	SCH
1	CYL/CORE	AS REQUIRED	
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: K02

EACH TO HAVE:

3	HINGE	5BB1 4.5 X 4.5	IVE
1	STOREROOM LOCK	L9080	SCH
1	CYL/CORE	AS REQUIRED	
1	SURFACE CLOSER	4011	LCN
1	KICK PLATE	8400 10" X 2" LDW B-CS	IVE
1	WALL STOP	WS401/402CVX	IVE
3	SILENCER	SR64	IVE

HARDWARE SET: L01

ALL HARDWARE BY OVERHEAD/ROLLING/COILING DOOR 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 Cornings 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. 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. Solarban70 Solar Gray + Clear
2. Solarban60 Solar Gray + Clear
3. Solarban70 Solar Bronze + Clear

(See corresponding SHGC and U-Value below when used with metal frame)

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

1.0 - GENERAL

1.1 Summary

A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.

B. Section Includes:
1. Porcelain Tile
2. Ceramic Tile
3. Quarry Tile
4. Glass Tile
5. Specialty Tile
6. Installation Products; adhesives, mortars, grouts and sealants
7. Waterproof membranes
8. Crack Isolation membranes
9. Thresholds, trim, cementitious backer units and other accessories specified herein.
10. Tile and grout care and maintenance recommendations.

1.2 References

A. American National Standards Institute (ANSI):
1. A108.1 - Installation of Ceramic Tile in a Mortar Bed
2. A108.5 - Installation of Ceramic tile with Dry-Set Portland Cement or Latex-Portland Cement
3. A108.10 - Installation of Grout in Tile work
4. A108.13 - Installation of Membranes for Thin-Set Ceramic Tile
5. A118.3 - Chemical Resistant, Water-Cleanable, Tile-Setting and-Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive
6. A118.4 - Latex-Portland Cement Mortar
7. A 118.5 - Chemical-Resistant Furan Mortar and Grout.
8. A118.6 - Ceramic Tile Grouts
9. A118.7 - Polymer Mortified Cement Grouts
10. A118.10 – Load-Bearing, Bonded Waterproofing Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations
11. A136.1 - Organic Adhesives for Installation of Ceramic Tile
12. A137.1 - Ceramic Tile

B. American Society for Testing and Materials (ASTM):
1. C 136 - Sieve Analysis of Fine and Coarse Aggregates
2. C 144 - Aggregate for Masonry Mortar
3. C 150 - Portland Cement
4. C 207 - Hydrated Lime for Masonry Purposes
5. C 373 - Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
6. C 503 - Marble Dimensional Stone (Exterior)
7. C 623 – Young's Modulus, Shear Modulus, and Poisson's Ratio for Glass and Glass-Ceramics by Resonance
8. C 627 – Robinson Floor Test for Tile Service Level
9. C 847-95 Metal Lath
10. C 933-96a Welded Wire Lath
11. C 1028 - Static Coefficient of Friction of Ceramic Tile and Other like Surfaces by the Horizontal Dynamometer Pull-Meter Method
12. D 87 - Melting Point of Petroleum Wax (Cooling Curve)

13. D 226 - Asphalt Saturated Organic Felt Used in Roofing and Waterproofing
14. D 4397 - Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
15. E-90 and E-413 for STC (Sound Transmission Class), E-492 and E-989 for IIC (Impact Insulation Class) – Sound Deadening Underlayments

C. TCA Handbook for Ceramic Tile Installation by Tile Council of America, latest edition

1.3 Submittals

A. Submit shop drawings, product data, and samples under provisions of Section 01350.

B. Shop Drawings:
1. Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
2. Locate and detail expansion and control joints.

C. Submit product data, specifications, and instructions for using mortars, adhesives and grouts.

D. Samples:
1. Submit color samples illustrating full color range of each type tile.
2. Grout: Submit manufacturer's full range of standard and designated color samples for each type for Architect's selection.

E. Submit following Informational Submittals:
1. Certifications specified in Quality Assurance article.
2. Qualification Data: Manufacturer's and installer's qualification data.
3. Manufacturer's instructions.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.4 Quality Assurance

A. Single Source Responsibility:
1. Obtain each type and color tile material required from single source.
2. Obtain setting and grouting materials from one manufacturer to ensure compatibility.
3. Furnish a 10 year guarantee from installation material manufacturer. The guarantee is inclusive of installation materials, finish product, and labor.
4. Obtain prefabricated edge protection and transition and movement profiles from one manufacturer to ensure compatibility.
5. Obtain membrane from same manufacturer as setting material or from manufacturer approved by setting material manufacturer to ensure compatibility.

B. Manufacturer Qualifications:
1. Tile: Minimum 5 years experience in manufacture of tile products.
2. Setting Materials: Minimum 10 years experience in manufacture of setting and grout materials specified.

C. Installer Qualifications: Specializing in tile work having minimum of 5 years successful documented experience with work comparable to that required for this Project.

D. Certifications:
   1. Maintain one copy each of all Referenced standards and specifications on site. Include the TCA Handbook, ANSI A108 Series, ANSI A118 Series ANCI A136.1 and ANSI A137.1 and others as specified under paragraph References.
   2. Submit manufacturer's certifications that mortars, adhesives, and grouts are suitable for intended use.

E. Conform to ANSI- Recommended Standard Specifications for Ceramic Tile - A137.1.

F. Conform to TCA Ceramic Tile: The Installation Handbook.

1.5 Delivery, Storage, and Handling

A. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.

B. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.

C. Broken, cracked, chipped, stained, or damaged tile will be rejected, whether built-in or not.

D. Protect mortar and grout materials against moisture, soiling, or staining.

1.6 Environmental Requirements

A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

B. Do not begin installation until building is completely enclosed and HVAC system is operating and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for a minimum of 2 weeks.

C. Maintain continuous and uniform building temperatures of not less than 50 degrees F during installation nor more than 100 degrees F.

D. Ventilate spaces receiving tile in accordance with material manufacturers' instructions.

1.7 Warranty

A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: 1 year after date of Substantial Completion.

1.8 Extra Materials

A. At completion of project, deliver to Owner extra stock of materials used on project as follows:
   1. Provide 10% of each size, color, and surface finish of tile.
   2. Six lineal feet of each color and type of base.

B. Store in location as directed by Owner.

C. Ensure materials are boxed and identified by manufacturer, type, and color.

1.9 Maintenance Data

A. Submit maintenance data under provisions of Section 01910.

B. Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.

2.0 - PRODUCTS

2.1 Manufacturers

A. Acceptable Manufacturer: Dal-Tile Corporation or pre-approved equal.

B. Requests for substitutions will be considered in accordance with provisions of Section 01360 received 10 days prior to bid.

2.2 Products

A. Ceramic Wall Tile
1. Manufacturer: Daltile
2. Product: Color Wheel Classic
3. Color: See Finish Schedule
4. Size: See Finish Schedule
5. Finish: Semi – Gloss
6. Pattern: As indicated on drawings.
7. Trim Units: Matching bead, bullnose, cove and base shapes in sizes coordinated with field tile.

B. Porcelain Floor Tile
1. Manufacturer: Daltile
2. Product: Keystones
3. Color: See Finish Schedule
4. Size: 2x2 Mosaic
5. Pattern: As indicated on drawings.
6. Trim Units: Matching bead, bullnose, cove and base shapes in sized coordinated with field tile.

2.3 Setting Materials

A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

B. Epoxy Adhesive: ANSI A118.3, thinset bond type.

C. Mortar Bed Materials:
1. Portland cement: ASTM C150, type 1, gray or white.
2. Hydrated Lime: ASTM C207, Type S.
3. Sand: ASTM C144, fine.
4. Latex additive: As approved.
5. Water: Clean and potable.

D. Mortar Bond Coat Materials:
1. Dry-Set Portland Cement type: ANSI A118.1.
2. Latex-Portland Cement type: ANSI A118.4.
3. Epoxy: ANSI A118.3, 100 percent solids.

E. Epoxy Grout: ANSI A118.8, 100 percent solids epoxy grout; color to be selected.

F. Waterproofing Membrane at Floors: Membrane in accordance with ANSI A118.10.

G. Membrane at Walls: No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type

H. Membrane at Walls: 4 mil (0.1 mm) thick polyethylene film, ASTM D4397.

I. Membrane at Walls: Reinforced asphalt paper.

J. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:
1. Thickness: 1/2 inch (13 mm).

2.4 Miscellaneous Materials

A. Temporary Protective Coating: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout, is compatible with tile and mortar/grout products, and is easily removable after grouting is completed without damaging grout or tile.
1. Petroleum paraffin wax, fully refined, tasteless, odorless, containing at least 0.5 percent oil with a melting point of 120-degree F to 140-degree F per ASTM D 87.

2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

2.5 Finishing Edge Protection Profiles

A. Manufacturer - Schluter Systems or pre-approved equal. Comply with Section 01360 - Product Substitution and submit at least 10 days prior to Bid. All other approved products shall be notified in writing via addendum.

B. Products:
1. Schluter: Quadec
2. Corners provide matching outside corners as required.
3. Material and Finish: Satin anodized aluminum.
4. Height as required
5. Location as noted on drawings

2.6 Mixing Mortar and Grout

Mix mortars and grouts in accordance with manufacturer's instructions.

3.0 - EXECUTION

3.1 Examination

A. Verify that all wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and float within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not

within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 Preparation

A. Clean substrates.

B. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of tiles.

C. Prepare surfaces in strict accordance with instructions of manufacturer whose setting materials or additives are being used.

D. Acid Based Cleaners: Use not permitted.

E. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials. Clean and maintain substrate in condition required by setting material manufacturer.

F. Do not seal substrate unless required by manufacturer.

G. Prime substrate when required by manufacturer.

H. Membrane
   1. Flash membrane up adjacent walls and restraining surfaces.
   2. Use preformed cove, corners, and expansion joint flashing.
   3. Allow membrane to cure as prior to setting tile.
   4. Do not allow construction traffic on membrane.

I. Apply primer-sealer to wood and plywood subfloors when recommended by setting materials manufacturer.

J. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

K. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:
   1. Petroleum paraffin wax or grout release.

3.3 Installation

A. Cement Board Substrate
   1. Place rough side out and fasten with galvanized or resin coated gypsum board screws at 8 inches on center in field of panel and at 6 inches on center at edges.
   2. Provide 1/4 inch gap above floor or fixture lip for flexible calking.
   3. Maintain manufacturer's required space between board edges.

4. Fill joints by applying tile setting material and joint reinforcement.

B. Vapor Retarder:
1. Extend vapor retarder to extremities of areas indicated to be protected from vapor transmission.
2. Secure in place with mechanical fasteners or adhesives.
3. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose mineral-fiber insulation.
4. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs.
5. Fasten vapor retarders to framing at top, end, and bottom edges, at perimeter of wall openings, and at lap joints; space fasteners no greater than 16 inches apart.
6. Seal joints in vapor retarders caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor retarder tape.
7. Repair tears and punctures in vapor retarder immediately before concealing it with the installation of cementitious backer units.

C. Membrane:
1. Install membrane with products or methods approved in writing by membrane manufacturer when joining, sealing, fastening, or adhering sheet membranes.
2. Flash membrane to cure prior to setting tile.
3. Do not allow construction traffic on membrane.

D. Crack Isolation Membrane
1. Install crack isolation membrane over cracks of up to 1/8 inch or greater in substrates. Apply a 12 inch wide strip centered on crack. Install in accordance with manufacturer's recommendations.
2. Install membrane with products or methods approved in writing by membrane manufacturer when joining, sealing, fastening, or adhering sheet membranes.

E. Waterproofing
1. Install waterproofing in strict compliance with manufacturer's instructions.
2. Flash waterproofing up adjacent walls in accordance to manufacturer's details, to a height of 4 inches.
3. Flood test waterproof membranes after fully cured.
4. Field Quality Control water test when required.

F. Tile Installation, General
1. Install tile materials in accordance with ANSI A137.1, other referenced ANSI and TCA specifications, and TCA "Handbook for Ceramic Tile Installation", except for more stringent requirements of manufacturer or these Specifications.
2. Cut and fit tile tight to protrusions and vertical interruptions and treat with a compatible sealant as specified in Section 07900
3. Form corners and bases neatly.
4. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joint watertight, without voids, cracks, excess mortar, or grout.
5. Prepare surface, fit, set, bond, grout and clean in accordance with applicable requirements of ANSI standards and Tile Council of America.

G. Layout

1. Lay out work to pattern indicated so that full tile or joint is centered on each wall and no tile of less than half width need be used. Do not interrupt pattern through openings. Lay out tile to minimize cutting and to avoid tile less than half size.
2. For heights stated in feet and inches, use courses of full tile to produce nearest attainable heights without cutting tile.
3. No staggered joints will be permitted.
4. Align joints in tile in both directions.
5. Align joints between floor and base tile.
6. Make joints between sheets of tile exactly same width as joints within sheet.
7. File edges of cut tile smooth and even.
8. Cut and fit tile at penetrations through tile. Do not damage visible surfaces. Carefully grind edges of tile abutting built-in items. Fit tile at outlets, piping and other penetrations so that plates, collars, or covers overlap tile.
9. Extend tile work into recesses and under or behind equipment and fixtures, to form complete covering without interruptions, except as otherwise indicated. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
10. Accurately form intersections and returns.
11. Form internal angles coved and external angles bullnosed.

H. Thin Set Method, Floors and Walls

1. Apply mortar or adhesive with notched trowel using scraping motion to work material into good contact with surface to be covered. Maintain 90 percent coverage on back of tile and fully bed all corners.
2. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
3. When installing large tiles, ceramics or mosaics, trowel small quantity of mortar or adhesive onto back of each tile or sheet of tiles.
4. Set tiles in place and rub or beat with small beating block.
5. Beat or rap tile to ensure proper bond and also to level surface of tile.
6. Align tile to show uniform joints and allow to set until firm.
7. Clean excess mortar or adhesive from surface of tile with wet cheese cloth (not a sponge) while mortar is fresh.
8. Allow face mounted tile to set until firm before removing paper and before grouting.
9. Sound tile after setting. Replace hollow sounding tiles.

I. Thick Bed Method, Horizontal Surfaces

1. Apply slurry bond coat approximately 1/16 inch thick to substrate surface using flat trowel.
2. Place thick bed mortar, 1-1/4 inch thick nominally onto slurry bond coat while coat is still wet and tacky.
3. Spread prepared mortar approximately one-half desired bed thickness and then lay reinforcing mesh.
4. Lap wire 3 inches and place additional mortar on top of wire to bring bed to required thickness.
5. Rod and compact mortar with steel trowel.
6. Before placing tiles on green or wet screed bed, apply slurry bond coat approximately 1/16 inch thick to mortar using flat trowel.
7. Apply mortar skim coat to back of each tile or sheet of tile immediately prior to placing on bed.

8. Place tiles in wet slurry coat before surface dries maintaining uniform joints.
9. After each tile or sheet of tiles is laid, beat tile with wooden block or rubber mallet to level surface and embed tiles.
10. Perform beating before mortar takes initial set.
11. Pitch surface to drain where required.
12. On hardened screed or mortar bed, install tiles by thin bed method.
13. Sound tiles after setting. Replace hollow sounding tiles.
14. Clean excess mortar or adhesive from surface of tile with wet cheese cloth (not a sponge) while mortar is fresh.

J. Grouting
1. Allow tiles to set a minimum of 48 hours before grouting.
2. If bonding materials are rapid setting, follow manufacturer's recommendations.
3. Install in accordance with grout manufacturer's recommendations and ANSI A108.10.
4. Pack joints full and free before mortar takes initial set.
5. Clean excess grout from surface with wet cheesecloth as work progresses. Do not use hydrosponges.
6. Cure after grouting by covering with Kraft or construction paper for 72 hours. Install sealant in vertical wall joints at interior corners.

K. Marble Threshold
1. Provide thresholds at wall or framed openings to other building areas not receiving tile.
2. Set one piece threshold in adhesive without voids, full width of door opening.
3. Point threshold base flush with adjoining tile floors.
4. Cope ends to fit door frame profile.

L. Control Joints and Other Sealant Usage
1. Install control joints where tile abuts retaining surfaces such as perimeter walls, curbs, columns, wall corners and directly over cold joints and control joints in structural surfaces conforming to architectural details.
2. Install control joint in floors at spacings as indicated in TCA Installation Handbook, unless noted otherwise.
3. Rake or cut control joints through setting bed to supporting slab or structure. Keep joints free of mortar.
4. Install in accordance with TCA Installation Handbook.
5. Fill joints with self-leveling polyurethane sealant and backing material specified in Section 07910.
6. Fill joints around toilet fixtures with white silicone sanitary sealant. Refer to Section 07910.

M. Expansion Joints:
1. Keep expansion joints free of mortar and grout.
2. Use manufacturer's expansion joint flashing when covering expansion joints with waterproof or crack isolation membranes.
3. Provide expansion joints directly over changes in material, over control and expansion joints in substrate, at juncture of floors and walls, at other restraining surfaces such as curbs, columns, bases, and wall corners, and where recommended by TCA EJ171 Expansion Joint requirements.
4. Install sealant in expansion joints.
5. Provide sealant material at items penetrating tile work, unless otherwise indicated.

6. Provide sealants and related materials in accordance with cited ANSI and TCA requirements.

3.4 Adjusting

Sound tile after setting. Replace hollow sounding units.

3.5 Cleaning

A. Clean excess mortar from surface with water as work progresses. Perform cleaning while mortar is fresh and before it hardens on surfaces.

B. Sponge and wash tile diagonally across joints. Polish with clean dry cloth.

C. Remove grout haze following recommendation of mortar additive manufacturer. Do not use acids for cleaning.

D. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

3.6 Protection

A. Prohibit traffic from floor finish for 72 hours after installation.

B. Where temporary use of new floors is unavoidable, supply large flat boards or plywood panels for walkways over Kraft paper.

C. Protect work so that it will be without any evidence of damage or use at time of acceptance.

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 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 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 time three 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 tegularized 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 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. Adhesives, including primer, shall be as manufactured or recommended by the manufacturer of the materials used.

C. 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

D. 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 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

A. 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

A. 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. Ceiling Application:
   **Note: Provide flat finish for gypsum board in ceiling applications.
   S-W: Pro-Mar Ceiling Paint, P200 Flat - B30W2651

2. 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

3. **Concrete Sealer:** Concrete MUST be etched, with H&C® Concrete Etcher or muriatic acid, following label directions.

Reducer/Cleaner --- Aromatic 100, R2K5, or R7K65
Brush – Use natural bristle brushes
Roller – Use a ¼" – 3/8" nap woven or other solvent-resistant cover
Freshly stained or painted surfaces will require cure time before any application of this H&C® High Performance Industrial Clear. Follow manufacturer's instructions and recommendations.

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

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 Related Documents

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

1.2 Related Work Specified Elsewhere

Mechanical Louvers: MECHANICAL - Division 15

1.3 Description of Work

A. Extent of architectural louvers and vents is indicated on architectural drawings, including indications of sizes, shape and locations.

B. Types of Louvers and Vents Including the Following: Extruded aluminum louvers.

C. Sealants including installation are specified in Division 7.

D. Field-applied paint is specified in Division 9.

E. Louvers in hollow metal doors and frames are specified in Division 8.

1.4 Quality Assurance

A. Performance Requirements: Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500.

AMCA Certification: Where indicated, provide louvers with AMCA Certified Ratings Seal evidencing that product complies with above requirement.

B. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

C. Field Measurements: Verify size, location and placement of louver units prior to fabrication, wherever possible.

D. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.5 Submittals

A. Product Data: Submit manufacture's specifications; certified test data, where applicable; and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details for sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. Samples: Submit 6" square samples of each required finish. Prepare samples on metal of same gage and alloy to be used in work. Where normal color and texture

variations are to be expected, include 2 or more units in each sample showing limits of such variations.

2.0 PRODUCTS

2.1. Acceptable Manufacturers

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Airline Products Co.
The Airolite Co.
Construction Specialties, Inc.
Metal-Aire Louver Company

2.2 Materials

A. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to provide required finish.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T52.

C. Fastenings: Use same material as items fastened, unless otherwise indicated. Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum. Provide types, gages and lengths to suit unit installation conditions. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

E. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.3 Fabrication, General

A. Provide louvers and accessories of design, materials, sizes, depth, arrangements, and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; air leakage, where applicable (for adjustable units, if any); strength; durability; and uniform appearance.

B. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.

C. Include supports, anchorages, and accessories required for complete assembly.

D. Provide vertical mullions of type and at spacings indicated but not further apart than recommended by manufacturer or 72" o.c., whichever is less. At horizontal joints between louver units provide horizontal mullions except where continuous vertical assemblies are indicated.

E. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

F. Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

2.4 Stationary Extruded Aluminum Wall Louvers

A. Horizontal Drainable Blade Louvers: Units designed to collect and drain water to exterior at sill by means of gutters in front edges or blades, and channels in jambs and mullions. Furnish units with extrusions not less than 0.081" thick, of depth, and sizes indicated, complying with following performance requirements.

1. Free Area: Not less than 50% for a 48" x 48" size.

2. Static Pressure Loss: not more than 0.15" of water gage at an airflow of 1050 fpm free area velocity in intake direction.

3. Water Penetration: Not more than 0.052 oz. per sq. ft. of free area at an airflow of 1000 fpm free area velocity.

4. AMCA Certification: Furnish units bearing AMCA Certified Ratings Seal.

2.5 Louver Screens

A. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated.

Provide frames consisting of U-shaped metal for permanently securing screen mesh.

B. Use Bird Screens where indicated, of the following: 2" sq. mesh. 0.063" aluminum wire.

C. Locate screens on inside face of louvers, unless otherwise indicated. Secure screens to louver frames with machine screws, spaced at each corner and at 12" o.c. between.

2.6 Metal Finishes

A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces with protective covering, prior to shipment. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process.

Provide colors or color matches as indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

B. Aluminum shall be thoroughly cleaned and pretreated. The cleaned and treated substrate shall be primed with Fluroprime to a thickness of .4 mils. The Fluropon paint shall be factory applied and oven baked. Paint shall contain 70% PVDF (Kynar 500). All colors shall be selected by the architect.

Apply protective coating of clear acrylic lacquer, not less than 0.05 mils dry film thickness.

3.0 EXECUTION

3.1 Preparation

Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 Installation

A. Locate and place louver units plumb, level and in proper alignment with adjacent work.

B. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers, as indicated.

D. Repair finishes damaged by cutting, welding, soldering and grinding operations required for fitting and jointing. Restore finishes to where there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

E. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.

F. Provide concealed gaskets, flashings, joint fillers, and insulations, and install as work progresses to make installations weathertight.

G. Refer to Division-7 sections for sealants in connection with installations of louvers.

END OF SECTION

1.0 - GENERAL

1.1 Scope

The work required under this section consists of room & wall signage.

1.2 Existing Conditions

A. It is the general contractor's responsibility to field verify existing signage before a bid and provide signage that shall match all existing signage types and styles currently installed to provide a continuity of design to the owner as required.

1.3 Submittals

A. Submit a sample of signs, including size, lettering style, 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 the schedule indicating each room name and number indicated on Architectural Drawings with a corresponding space for the Owner's markup for the 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. Leeds Architectural Letters, Inc. (Basis Of Design)
2. Devaney Sign Service, LLC
3. Bellco Sign & Engraving Specialists

2.2 Room and Wall Signs Standards

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 the 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. Exterior Signs - Exterior Aluminum .040 thick, factory painted, and text to be silkscreened or inkjet print.

E. Edge Condition - Square Cut.

F. Corners - Round.

G. 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 the wall adjacent to the latch side of the door 60" from floor to centerline of signs and 2" from the edge of the door frame to edge of the sign.

2.3 Typical Signage Schedule (refer to Architectural Signage Plan in construction documents)

A. All Offices shall be 6" x 8" with a 2-1/2" x 8" changeable clear message insert unless otherwise indicated. **Refer to Item 1.2, Item A for existing signage conditions**

B. All other interior door signs except corridor and vestibule doors shall be a 6" x 6" with no message strip.

C. All restrooms shall have a minimum 6" x 8" sign with pictogram area with an additional area for raised copy and Braille.

D. 6" x 6" tactile exit sign at all interior exit doors leading directly to the exterior with raised copy and Braille. (Identified as **EXIT** on signage plan)

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.

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, Asphalt Shingles Section 07310

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

SECTION 10505 – OPEN METAL ATHLETIC SPORT LOCKERS

1.0 - GENERAL

1.1 Related Documents

A. General Conditions

B. Division One

1.2 Scope Of Work

A. Description: Furnish and install factory-assembled Heavy-Duty MIG-Welded Metal Lockers, complete, as shown and specified per contract documents.

1.3 Related Work Specified Elsewhere:

A. Concrete: Section 03320

B. Rough Carpentry: Section 06100

C. Finish Carpentry: Section 06210

1.4 Submittals

A. Refer to Section 01350 - Submittals

B. Shop Drawings: Submit drawings showing locker types, sizes, quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces.

C. Color Charts: Provide color charts showing manufacturer's available colors (minimum 24). Provide metal samples if requested.

D. Numbering: Locker numbering sequence will be provided by the approving authority and noted on approved shop drawings returned to the locker contractor.

1.5 Quality Assurance

A. Manufacturing Standard: Provide metal lockers that are standard products of a single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.

B. Fabricator Qualifications: Firm experience (minimum 5 years) in successfully producing the type of metal lockers indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

C Installer Qualifications: Engage an experienced (minimum 2 years) installer who has successfully completed installation of the type of metal lockers and extent to that indicated for this project.

1.6 Product Handling

A. All work shall be fabricated in ample time so as to not delay construction process.

B. All materials shall be delivered to the site at such a time as required for proper coordination of the work. Materials are to be received in the manufacturer's original, unopened packages and shall bear the manufacturer's label.

C. Store all materials in a dry and well-ventilated place adequately protected from the elements.

1.7 Guarantee

LIFETIME WARRANTY: Submit upon completion of the work, warranty covering all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

2.0 - PRODUCTS

2.1 Manufacturers

A. Subject to compliance with the design, material, method of fabrication and installation as required in this specification section or modified as shown on drawings. Manufacturers offering products which may be incorporated in the work include the following:

List Industries Inc. (Basis of Design)
Art Metal Products, Pro Sport Series
Penco Products, Angle Iron Series

B. Other Locker manufacturers may submit for preapproval at least 10 days prior to bid. Comply with Section 01360.

2.2 Locker Types

A. Type 1 - General: Lockers shall be "Superior All-Star Open Front Sport Lockers" as manufactured by List industries Inc. or approved equal.

All-Star Lockers:

1. Type: Open Front

2. Size: 24" wide x 22" deep x 74-3/4" high

2.3 Fabrication

A. Materials:

1. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of custom blend powder coat.

2 Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slotless type; self locking nuts or lock washers.

3. Hardware: Hooks and hang rods of cadmium plated or zinc plated steel or cast aluminum. Coat Rods of stainless steel tube.

4. Handle: Zinc plated, cold rolled finger pull

5. Number Plates: To be aluminum with not less that 3/8" high etched numbers attached to door with two aluminum rivets.

B. Construction

All lockers shall be factory-assembled, of all **MIG** welded construction, in multiple column units to meet job conditions**. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable.** Grind exposed welds and metal edges flush and make safe to touch.

1. Frame / Vertical Side panels: Shall be of 13-gauge 1/2" flattened expanded metal framed by 16 gauge Hollow "T" tubular sections and channel frame members designed to enclose all four edges of the side panel with the entire assembly MIG welded to form a rigid frame for each locker. The channel frame members are welded to the front and rear vertical frame members to create and anchor bearing surface of 1-1/4 inches wide x the depth of the locker at each side panel. **Note: Diamond perforated sheet steel or 3/4" expanded metal will NOT be accepted.**

2. Locker Base:
   4" Concrete Curb by others

3. Flat Tops: Shall be formed of one piece of 16-gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit.

4. Hat Shelves, Intermediate Shelves and Bottoms: - Shall be 16-gauge galvanneal sheet steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side. **Locker bottom shelf located less than 2" above floor level will not be acceptable.**

5. Backs: Shall be 18-gauge cold rolled sheet steel, be continuous to cover a multiple framed unit and welded to frame member.

6. Upper Security Compartment **(Choose from the following)**
   a. Wallet Security Box: Shall be 7-1/4" wide x 9" deep x 7-1/4" high fabricated from 16-gauge cold rolled sheet steel and include a 14-gauge side hinged solid door. Door hinge shall be a 16-gauge piano hinge. Security Box to be securely riveted to the front right corner of hat shelf. Door to have a combination friction catch door pull. Padlock Strike Plates are optional.

7. Lower Seat or Foot Locker **(Choose 1)**
   a. Optional Lower Seat/Shelf: Shall be 16-gauge galvanneal sheet steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side. A reinforcing bar shall be welded to the inside of the front return bend for added strength.

2.4 Locker Accessories

A. Equipment: Furnish each locker with two single prong hooks at back of underside of shelf and one 1" O.D. stainless steel tube coat rod factory attached below upper hat shelf.

1. Finished End Panels: Shall be "Boxed" type formed from 16-gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.

2. Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel

frame member and be continuous to cover the full width of a multiple framed locker unit.

3. Fillers: Provide where indicated, of not less than 16-gauge sheet steel, factory fabricated and finished to match lockers.

B. Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. **Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the door and footlocker seat may be one of any other color chosen from manufacturers standard selection.**

C. Lockers shall be GREENGUARD GOLD Certified

D. Provide Padlock Hasp – Locks by Owner.

3.0 - EXECUTION

3.1 Installation

A. General: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.

B. Placement: Lockers shall be set in place, plumb, level, rigid, flush and securely attached to the wall (or bolted together if back-to-back) and anchored to the floor or base according to manufacturer's specifications.

C. Anchorage: About 48" o.c., unless otherwise recommended by manufacturer, and apply where necessary to avoid metal distortion, using concealed fasteners. Friction cups are not acceptable.

D. Trim: Sloping tops, metal fillers and end panels shall be installed using concealed fasteners. Provide flush, hairline joints against adjacent surfaces.

3.2 Adjustment

Upon completion of installation, inspect lockers and adjust as necessary for proper door operation. Touch-up scratches and abrasions to match original finish.

END OF SECTION

1.0 - GENERAL

1.1 Scope
The work of this section shall include all labor, material, and equipment necessary to furnish and install Walkway Cover and accessories hereafter specified and/or indicated on the Drawings.

1.2 Manufacturer
Walkway Cover shall be Tennessee Valley Metals, Peachtree Protective Covers, Inc., Superior Metals, Mitchell Metals or approved equal as long as they meet or exceed specifications and adhere to drawing details.

1.3 Shop Drawings
Shop drawings shall be generated under the services of a structural engineer licensed in the State of Alabama, sealed and signed and submitted to the architect for approval before fabrication. These drawings to show: size, arrangement, foundation and type of material, connections and relationship to adjacent work and compliance with applicable codes.

1.4 Guarantee
The Walkway Cover Contractor shall guarantee all materials and workmanship covered by this section for a period of one (1) year from date of final acceptance of the Contract, or from occupancy of the building, whichever is earlier.

2.0 - PRODUCTS

2.1 General
A. Structural roof system for walkway shall be complete with all required components and accessories as shown on the Drawings and as required.

B. The system shall be designed to structurally withstand severe icing, heavy hail, and 110 mph wind loads. Minimal structural capacity for all components shall meet the latest edition of the IBC as adopted by the Authority having jurisdiction.

2.2 Concealed Drainage
Water shall drain internally from deck to beams and/or to columns, spouting out at ground level through columns.

2.3 Materials
A. Roof Panel: The self-supporting aluminum Roof Panel shall be an alloy accurately roll formed to the deep channel design shown on the Drawing. It shall have a depth required for span and be furnished with an interlocking design to provide a weathertight load-bearing deck. The gauge of the panels shall be as required to support the load in accordance with engineering prints and calculations provided by the manufacturer. Material to be baked enamel acrylic. Color as selected by Architect.

B. Roll-formed Fascia: The fascia shall be accurately roll formed from an aluminum alloy to the sculptured design shown on the drawing so that it will serve as a built-in gutter for roof drainage and as a structural frame member with a height of not less than 6-1/4" and a gutter width of not less than 2-3/8".

Gutter cross sectional area shall be 4 square inches. Fascia gauge shall be as required for the load to be supported in accordance with engineering prints and calculations provided by the manufacturer. Materials to be baked enamel acrylic. Color as selected by Architect.

C. Finish: The enameled finish on roof panels, roll-formed fascia and related enameled components shall be designed for optimum performance in exterior installations under all environmental conditions. The finish shall be applied in accordance with and conform to or exceed the Painted Sheet "Quality Standards" and recommended ASTM, Military and/or Federal Test Methods specified by the Aluminum Association in their publication "Aluminum Standards & Data".

All exposed materials shall be pre-finished. Color choices shall include industry standard bronze, dark bronze, medium bronze, white, cream, etc.

Galvanized metal shall be solvent clean with VM&P Naphtha.
Primer: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310

Finish: Apply two coats
S-W Pro Industrial HP Acrylic Coating, S/G, B66-650
OR S-W Pro Industrial HP Acrylic Coating, Gloss, B66-600

Non-primed metal shall be cleaned and etched with approved acid and washed with water.
Primer: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310

Finish: Apply two coats
S-W Pro Industrial HP Acrylic Coating, S/G, B66-650
OR S-W Pro Industrial HP Acrylic Coating, Gloss, B66-600

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.

Spot Primer Coat – S-W Pro Industrial Pro-Cryl Universal Primer, B66-310
Finish: Apply two coats
S-W Pro Industrial HP Acrylic Coating, S/G, B66-650
OR S-W Pro Industrial HP Acrylic Coating, Gloss, B66-600

D. Component Accessories: Roof Brackets, Post Brackets, Flashing, etc., shall be of same materials and finishes as specified for prime components. Each part and its use is described in the engineering prints and calculations provided by the manufacturer. Each part shall be used as specified in the aforementioned prints. Posts shall be used as specified. All components must match finish color as selected by Architect.

E. Hardware: All bolts, nuts, washers, and screws used in joining the members of the canopy together shall be stainless steel up to 1/4" diameter nominal size. Any hardware 1/4" diameter and larger shall be hot dip galvanized to withstand 200 hours' salt spray test of maximum resistance to rust and corrosion. Provide concealed fasteners where possible. All hardware must match finish color as selected by Architect.

3.0 - EXECUTION

3.1 Installation

A. Installed units shall have the following minimum pitch for water drainage of the roof. Minimum pitch for all panels and fascia:
Up to 10'-1/8" ft.
Over 10'-1/4" ft.

B. Installed unit shall be properly caulked with a suitable, high quality material where needed and where specified.

C. Installed unit shall meet local building code requirements and conform to the engineering prints provided by the manufacturer.

3.2 Erection

A. Columns and beams shall be aligned with care before columns are grouted. Downspout columns shall be filled to the discharge level to prevent standing water, and downspout deflectors installed after grouting.

B. Grout shall be #2000 compressive strength. Mix by volume, 1 part Portland cement and 3 parts masonry sand. Add water to make pouring consistency and vibrate with a small rod to fill voids.

C. Extreme care shall be taken to prevent damage or scratching. All workmanship must be of the very best, with neat miters and fitted joints.

3.3 Flashing

At adjoining construction, as indicated or required.

3.4 Clean Up

Remove all debris from the site as it accumulates. Clean Protective Walkway Cover at completion of installation and leave in as new condition.

END OF SECTION

1.0 - GENERAL

1.1 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. Provide all equipment and materials, and do all work necessary to furnish and install the protective wall padding as indicated on the drawings.

1.3 QUALITY ASSURANCE

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   1. National Collegiate Athletic Association (NCAA)
   2. International Association of Athletics Federations (IAAF)
   3. ASTM International
   4. Manufacturers Data and Recommended Installation Requirements

1.4 SUBMITTALS

A. Manufacturers Product Data
   1. Provide manufacturers product data and installation instructions prior to actual field installation work, for Architect and Owner review.

B. Shop Drawings
   1. Provide drawings of the manufacturers recommended installation and foundation requirements prior to actual field installation work, for Architect and Owner review.

1.5 QUALITY ASSURANCE

A. Provide Manufacturer's warranties to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.6 PRODUCT DELIVERY AND STORAGE

A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owner. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored above ground under protective cover or indoors so as to provide proper protection.

2.0 - PRODUCTS

2.1 PADDING AND ACCESSORIES

A. Protective Padding as Manufactured and/or Supplied by:
   1. Sportsfield Specialties, Inc.
      41155 State Highway 10, Delhi, NY 13753 (Phone 888-975-3343)
   2. Jaypro Sports, 976 Hartford Turnpike, Waterford, CT (Phone 1-800-243-0533).
   3. Approved Substitute

B. COMPONENTS:
   1. Engineered 3" High-Density Polyurethane (HDPU) Open Cell Foam (Field-Side)
      a. Designed to Provide Soft "Feel" Upon Mild Contact while Safely Absorbing Maximum Impact Velocities
      b. Superior Resilience at High Impacts and Multi-Strike Energy Management
      c. Engineered to Maximize Impact Absorption While Limiting Thermal Variation That Causes Wrinkles
      d. Density: 2.10 +/- 0.10 pcf (ASTM D3574)
      e. Impression Load Deflection (4" x 25" x 25" Sample)
         1. 25%: 80 – 100 (ASTM D3574)
         2. 65%: 128 – 145 (ASTM D3574)
         3. Support Factor 65/25: 1.7 min (ASTM D3574)
      f. Resilience (% Rebound): 40 – 48 (ASTM D3574)
      g. Tear Resistance: 1.0 – 2.0 lbs/in (ASTM D3574)
      h. Static Fatigue (Procedure A: 75% Deflection, 17 hrs):
         1. % Loss @ 25% ILD: Less than 30 (ASTM D3574)
         2. % Loss in Thickness: Less than 5 (ASTM D3574)
      i. Flammability: Passes with Class 1 Fabric (California TB 117-2013)
   2. Premium Outdoor Vinyl Encasement:
      a. High UV Resistance
      b. Total Weight: 19 oz./yd2 (ASTM D3776)
      c. Construction: 18 x 18, 1300 x 1300 Denier
      d. Grab Tensile: Warp 750 lb/2", Fill 655 lb/2". (ASTM D5034)
      e. Tongue Tear: Warp 153 lb/in., Fill 135 lb/in (ASTM D2261)
      f. Adhesion: 38 lb/2" (ASTM D571)
      g. Flame Resistance: Class 1 (ASTM E-84), CFSM, NFPA-701
      h. Cold Crack: -30° F (ASTM D2136)
      i. Rot, Mildew and Fungus Resistant: Yes
   3. 3/4" Square Edge AdvanTech® Water Resistant Sheathing Panel; All Sides Stained and Sealed with Exterior Grade Finish
   4. Stainless Steel Staples and Applicable Hardware
   5. Wall Mounting Hardware:
      a. Aluminum Z-Clip Wall Mounting Hardware
   6. Impact Testing; Independently Certified:
      a. ASTM F2440; 10 lb. x 6.3" Dia. Hemisphere Head Form, 4' Drop Height (Impact Velocity: 10.9 MPH):
         1. G-max: 44
         2. Head Injury Criterion (HIC): 115
   7. Head Injury Criterion (HIC) Impact Test: 10 lb. x 6.3" Dia. Hemisphere Head Form, 5' Drop Height (Impact Velocity: 12.2 MPH):

1. G-max: 51
2. Head Injury Criterion (HIC): 154

8. Head Injury Criterion (HIC) Impact Test: 10 lb. x 6.3" Dia. Hemisphere Head Form, 9' Drop Height (Impact Velocity: 16.4 MPH):
   1. G-max: 134
   2. Head Injury Criterion (HIC): 578
9. 3-Year Manufacturer's Limited Product Warranty

C. Color: To be selected by Owner

2.2 RAIL PADDING AND ACCESSORIES

A. Protective Padding as Manufactured and/or Supplied by:
1. Sportsfield Specialties, Inc.
   41155 State Highway 10, Delhi, NY 13753 (Phone 888-975-3343)
2. Jaypro Sports, 976 Hartford Turnpike, Waterford, CT (Phone 1-800-243-0533).
3. Approved Substitute

B. COMPONENTS:
1. Dimensions: 8"W x Variable Length x 1" Thick
2. Outdoor Vinyl Encasement:
   a. High UV Resistance
   b. Total Weight: 18 oz./yd2 (ASTM D3776)
   c. Construction: 84% Vinyl Coating, 16% Polyester Fabric (ASTM D751)
   d. Tongue Tear: Warp 93 lbs., Fill 68 lbs. (ASTM D751)
   e. Grab Tensile: Warp 232 lbs., Fill 213 lbs. (ASTM D751)
   f. Adhesion: Warp 28 lbs/in, Fill 40 lbs/in (ASTM D751)
   g. Abrasion: > 1000 Cycles (ASTM D3389-94)
   h. Cold Crack: -49° F (ASTM D2136)
   i. Rot, Mildew and Fungus Resistant: Yes
   j Flame Resistance: None

C. 1" Thick High Impact 1690 Polyurethane Foam
1. Density: 1.60 +/- 0.10 (ASTM D3574)
2. Impression Load Deflection (4" x 25" x 25" Sample)
   a. 25%: 85 – 95 (ASTM D3574)
   b. 65%: 145 – 162 (ASTM D3574)
   c. Support Factor 65/25: 1.7 min (ASTM D3574)
3. Resilience (% Rebound): 25 – 35 (ASTM D3574)
4. Tear Resistance: 1.0 – 2.0 lbs/in (ASTM D3574)
5. Static Fatigue:
   a. % Loss @ 25% ILD: Less than 35 (ASTM D3574)
   b. % Loss in Thickness: Less than 10 (ASTM D3574)

D. Vinyl Seams Double Stitched Using 6 lb. Bonded Polyester Black Thread

E. Includes Two (2) 1.5"W Vinyl Flaps with #2 Stainless Steel Grommets 6" On-Center
1. Designed to Wrap 1.5" to 2" O.D. Guard Rails
2. Secured to Railing with 8"L x 120 lb. Break Strength UV Resistant Nylon Zip-Ties or Lacing Cord

F. 1-Year Manufacturer's Limited Product Warranty

G. Color: To be selected by Owner

3.0- -EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Field Wall Padding and Accessories shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings. Installer should have a minimum of five (5) protective padding installations or similar experience in the previous three (3) years.

END OF SECTION

1.0 - GENERAL

1.1 Scope
The work under this section consists of all toilet accessories.

1.2 Samples
Returnable samples to be furnished upon request.

1.3 Manufacturer
Catalog numbers indicated in the schedule are from Bobrick Company catalog unless indicated otherwise. Equivalent products as manufactured by American Specialties, Inc., or Bradley, will be acceptable.

2.0 - PRODUCTS

2.1 List of Fixtures

A. The following list of accessories is essentially complete; however, the contractor shall examine the drawings carefully and shall supply such items not specifically called for to provide a complete installation.

B. Fixtures shall be supplied as follows:

1. Feminine Napkin Disposal - Model B-270, surface mounted, stainless steel finish. One per toilet compartment. (Female Only. Mount on opposite wall of toilet paper dispenser.) Provide at all Unisex Toilet locations.

2. Framed Mirror - Model B-165-1830, surface mounted, stainless steel finish. One per lavatory where noted. Custom mirrors are specified under Section 08810 - Glass and Glazing.

3. Grab Bars - Model B6806 (or 6861 at Shower Stall as indicated), 1-1/2" diameter, surface mounted with B-2571 anchors at masonry walls, stainless steel finish. Provide per ADA requirements at Handicapped Toilet Compartment and Shower Stall.

4. Mop and Broom Holder - Model B-223 x 36" surface mount, stainless steel, Type 302 (18-8) satin finish. Holders spring loaded, rubber cam with plated steel retainer. Mounting height 6'-0" floor to top. One per service and/or mop sinks.

5. Coat hook with bumper - Model B-212, surface mount aluminum casting with satin finish to match stainless steel. Bumper is hard rubber secured with drive screw. Note: provide one (1) in toilet rooms without stalls.

6. Shower Curtain and Rod - Model B-6047 x width required. Extra heavy-duty stainless steel, Type 304, 18 gauge, 1-1/4" diameter. Vinyl shower curtain: Model # 204-2, white, with Hooks: Model 204-1. One each per shower compartment.

7. Folding Shower Seat – Model B-5181, Stainless Steel with 1/2" phenolic seat as indicated on drawings.

2.2 Finishes

A. All fixtures specified or cataloged to be stainless steel shall be type 302 (18-8) with satin finish.

B. All fixtures specified or cataloged to be chrome finish shall be triple plated with heavy chrome over nickel and copper.

C. Mirrors shall be 1/4" electro-copper backed plate glass.

3.0 - EXECUTION

3.1 Attachment

A. All fixtures shall be secured to walls or partitions in the most secure method possible. Fixtures mounted singly against concrete block shall be secured with toggle bolts.

B. The proper mounting accessories shall be furnished with each item.

C. Contractor shall verify with Architect, the mounting locations and heights before installing accessories.

END OF SECTION

SECTION 11400 – FOOD SERVICE EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section covers Food Service Equipment, including all Materials, accessories, labor equipment, and services necessary to complete the work. General conditions, Supplementary Conditions, and applicable portions of Division 1 apply to work of this section.

1.02 RELATED WORK SPECIFIED AND PROVIDED UNDER OTHER SECTIONS

A. PLUMBING.

B. MECHANICAL.

C. ELECTRICAL.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of food service equipment of types, capacities, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: Firms with at least three (3) years of successful installation experience on projects with food service equipment similar to that required for project.

C. Fabricator's Qualifications: Where indicated units required custom fabrication, provide units fabricated by shop which is skilled and with a minimum of five (5) years of experience in similar work. Fabricate all custom equipment items at same shop. Where units cannot be fully shop-fabricated, complete fabrication work at project site. Approved fabricators are: Low Temp Mfg. Co., Ace Fabrication, and Universal Stainless.

1.04 CODES AND STANDARDS

A. NSF Standards: Comply with applicable National Sanitation Foundation (NSF) standards and recommend criteria. Provide each principal item of food service equipment with a NSF "Seal of Approval."

B. UL Labels: Where available, provide UL labels on prime electrical components of food service equipment. Provide U.L "recognized marking" on other items with electrical components, signifying listing by UL where available.

C. ANSI Standards: Comply with applicable ANSI standards for electrically powered and gas-burning appliances, for piping to compressed gas cylinders, and for plumbing fittings including vacuum breakers and air gaps to prevent siphonage in water piping.

D. NFPA Codes: Install food service equipment in accordance with the following National Fire Protection Codes (NFPA) Codes:
   1. NFPA 54-National Fuel Gas Code.
   2. NFPA 70-National Electrical Code.

3. NFPA 96-Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.

E. ASME Boiler Code: Construct steam generating and close steam heated equipment to comply with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code; Section IV for units not exceeding 15 psi or 250 degrees. F. (121 degrees C.), or Section 1 for higher pressure/temperature units.

F. Health Code: Install food service equipment in accordance with local health department applicable regulations.

G. Building and Local Codes: Construction and installation shall comply with all applicable local building, utility, safety and fire codes and regulations including, but not limited to, the codes and standards listed in "CODES AND STANDARDS" Section of Division 1.

1.05 RELATED DOCUMENTS

A. Plans and specifications are based upon products or systems of first named manufacturer. Any modifications and or substitutions other than the first named that require changes in plumbing, mechanical, or electrical shall be coordinated and paid for by the food service equipment contractor.

1.06 SUBMITTALS AND CLOSEOUT

A. Product Data: Submit manufacturer's product specifications and installation instructions for each item; include rough-in dimensions, service connection requirements, performance, power/fuel requirements, water/drainage requirements, and other similar information.

B. Shop Drawings: SUBMIT ROUGH-IN DRAWINGS WITHIN 30 DAYS AFTER NOTIFICATION TO PROCEED, to allow for timely installation and coordination of all trades. Submit dimensioned rough-in drawings, at minimum of scale ½" = 1'0", showing mechanical and electrical requirements. Submit dimensioned fabrication drawings for custom fabricated equipment including plans, elevations, and sections, at minimum scale of ¾" = 1'0", showing materials and gauges used.

C. Instruction: After final connections have been made, this contractor shall carefully examine and adjust all operative equipment and instruct personnel in the correct operation and the manufacturer's recommended maintenance procedures.

D. Maintenance Data: Furnish three (3) sets of dimensional prints, data sheets, spare parts list, wiring diagrams, and operational instructions for each piece of operation equipment, each set neatly bound in a stiff-back cover, in accordance with requirements of Division 1.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver food service equipment in factory-fabricated containers designed to protect equipment and finish until final installation. Make arrangements to receive equipment at project site or hold in warehouse until delivery can be made to job site.

B. Store food service equipment in original containers, and in location to provide adequate protection to equipment while not interfering with other construction operations.

C. Handle food service equipment carefully to avoid damage to components, enclosures, and finish. Do not install damaged food service equipment; replace and return damaged components to equipment manufacturer.

1.08 GUARANTEES

A. The Food Service Equipment Contractor (FSEC) shall guarantee in writing all materials and workmanship of equipment provided under this Contract for a period of one year from date of final acceptance, unless otherwise noted. Any defects due to the use of improper materials or workmanship and not due to carelessness or misuse occurring within that time shall promptly be rectified by the FSEC at his own expense upon notification by the Owner or Architect.

B. Provide five (5) year warranty (four additional years) on all compressors including parts, labor, travel, and time "non-prorated."

1.09 SERVICES

A. In the event the architectural, plumbing, mechanical and/or electrical requirements of the equipment furnished are different from that specified, and/or shown on the drawings, the FSEC shall be responsible for any additional costs caused by such differences. At the time shop drawings are submitted such changes shall be brought to the attention of the Architect.

1.10 GENERAL

A. Unless otherwise specified, or shown on the drawings, all material shall be new, of best quality, perfect and without flaws at the time of acceptance. All fabricated equipment, where applicable, is to be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their bulletin on Food Service Equipment entitled "Standard NSF 2", latest edition, and in full compliance with the Public Health Regulations of the locality in which the installation is to be made. All electrical equipment shall be UL approved.

1.11 ALTERNATES OF MATERIALS AND EQUIPMENT

A. Whenever a material, article, or piece of equipment is identified on the Drawing or in the specifications by reference to manufacturers or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard. Any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design, will be considered equally accepted provided, in the opinion of the Architect and evaluation by the Child Nutrition Program Director, it is of comparable substance, construction, appearance and function. It will not be approved for purchase without the written approval of the Child Nutrition Program Director and Architect. The contractor shall submit complete illustrations, specifications, capacities, and utilities, and operational data. Alternate items will be submitted at least ten (10) days before bid date for review and consideration. Items that are acceptable will be so stated in an Addendum.

PART 2 – SEE PLANS AND EQUIPMENT LIST FOR INFORMTION

PART 3 – EXECUTION
3.01 GENERAL

A. Items to be installed shall be carefully protected from damage during the construction period. All items which are damaged as a result of the Work shall be repaired or replaced to the full satisfaction of the Owner at cost to the FSEC.

3.02 INSPECTION:

A. Rough-In-Work: Installer must examine roughed-in mechanical and electrical services, and installation of floors, walls, columns, and ceilings, and other conditions under which food service work is to be installed; verify dimensions of services and substrates before fabricating work. Notify Contractor of unsatisfactory locations and dimensions of other work, and of unsatisfactory conditions for proper installation of food service equipment. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions have been corrected in a manner satisfactory to Installer.

3.03 INSTALLATIONS:

A. Shall be in accordance with the Specifications, drawings, and approved shop drawings and be accomplished in a first class workmanship like manner. Set equipment as indicated on the drawings—plumbing and electrical connections covered under other branches of the work. After the equipment has been set, thoroughly clean and polish all surfaces.

B. Setting: Set each item of nonmobile and nonportable equipment securely in place level and adjust to correct height. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorage where possible. Adjust counter tops and other work surfaces to a level tolerance of 1/16" maximum offset, and maximum variation from level or indicated slope of 1/16" per foot.
   1. Where indicated, or required for safety of equipment operator, anchor equipment to floor or wall. Where equipment is indicated to be anchored to floor, provide legs with adjustable flanged foot. Install 2 anchors on each foot.
   2. Set all Owner furnished equipment without legs on existing rolling stands provided by Owner. Sand, clean and paint stands before setting equipment. Lubricate all casters to operate easily. Verify anchorage location at existing unit.
   3. For owner furnished equipment, FSEC TO MOVE AND SET IN PLACE IN NEW KITCHEN, VERIFY PLUMBING AND UTILITY REQUIREMENTS FOR CONNECTION TO UDS SYSTEM BY PLUMBING AND ELECTRICAL CONTRACTORS.

C. Field Joints: Complete field assembly joints in work (joints which cannot be completed in shop) by welding, bolting-and-gasketing, or similar methods as indicated. Grind welds smooth and restore finish. Set or trim gaskets flush.

D. Enclosed Spaces: Treat enclosed spaces that are inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at a rate of 4 oz. per sq. ft. This includes areas below all cabinet units, coolers, freezer, etc.

E. Closure Plates and Strips: Install where required, with joints coordinated with units of equipment.

F. Cut-outs: Provide cut-outs in food service equipment where required to run plumbing electric, gas or steam lines through equipment items for final connections. Coordination of Electrical Contractor, all electrical boxes to be minimum 6" A.F.F.

G. Sealants and gaskets: Install all around each unit to make joints air-tight, water-tight, vermin-proof, and sanitary for cleaning purposes. In general, make sealed joints not less than 1/8" wide, and stuff with backer rod to shape sealant bead properly, at ¼" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint. At internal-corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" joint width, metal closure strips for wider joints, with sealant application each side of strips. Anchor gaskets mechanically or with adhesives to prevent displacement.

H. Dishwashing Tables and Three Compartment sink: All joints and connections to be continuous welded, and welds ground smooth and polished to match. Close all breaks in backsplash to form continuous uniform backsplash appearance and close all ends of table with backsplash or rolled edge. Install table legs to provide table support at all ends and corners and install bottom shelf.

3.04 FIELD QUALITY CONTROL

A. Delay start-up of food service equipment until service lines have been tested balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation. Before testing, lubricate each equipment items in accordance with manufacturer's recommendations.

B. Test each item of operational equipment to demonstrate that it is operating properly, and that controls and safety devices are function. Repair or replace equipment, which is found to be defective in its operation, including units which are below capacity or operating with

3.05 CLEANING:

A. After completion of installation and completion of other major work in food service areas, remove protective coverings, if any, and clean all food service equipment, internally and externally. Restore exposed and semi-exposed finishes too remove abrasions and other damages; polish exposed-metal surfaces and touch-up painted surfaces. Replace work which cannot be successfully restored to the satisfaction of the Owner and the Architect, at no additional cost to the Owner.

B. Prior to date of substantial completion on food service equipment work, buff exposed stainless steel finishes lightly, using power buffer and polishing rough or grit of No. 400 or finer.

3.06 CLOSEOUT PROCEDURES:

A. Provide services of Installers' technical representative and Owner's personnel in safe operation and maintenance of food service equipment.

B. Schedule training with Owner, provide at least 7-day notice to Contractor and Architect/Engineer of training date.

3.07 CLEAN-UP:

A. Final Cleaning: After testing and start-up, and before time of substantial completion, clean and sanitize food service equipment, and leave in condition ready for use in food service.

B. Remove all excess materials and debris from site.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All work included under this section is subject to Architect's provisions covering: Invitation to Bid, Proposal Form, Instructions to Bidders, General Conditions, and all other Supplementary General Conditions as may be added.

1.2 SCOPE OF WORK

A. All specified equipment to be delivered to job site, freight prepaid, uncrated, assembled and set in proper area, ready for final connections, where required, as specified in Divisions 15 and 16 of Contract Documents.

1.3 DESCRIPTION

A. The plans indicate the location of the equipment. Slight changes due to the varying dimensions of equipment and wall construction shall be permitted with approval by the Architect.

B. These typed Specifications shall be closely correlated with the Drawings and Schedule. Each complements the other and cross-reference shall be necessary to fulfill the requirements of these Specifications. All information shown on Drawings and listed in Schedules are to be incorporated as part of the written Specifications.

C. Conflict in Plans and Specifications where changes, alterations, additions, or deductions are necessary, or where exceptions are taken with regard to sizes, locations, and other details shown on plans, shall be reported in writing for a decision by the Architect.

D. The Contractor shall be responsible for seeing that the equipment can be entered through openings before doors and walls are finished.

1.4 WORK BY OTHERS

A. The General Contractor shall provide openings and passage ways of sufficient to sustain the weight of the Equipment Supplier and he shall provide openings and passage ways of sufficient size to permit the delivery and erection of the equipment to their respective locations without dismantling. Coordination of these openings is critical for the equipment installation. The General Contractor shall provide depressed floor for drains grates and walk-in cooler/freezer when noted.

1.5 QUALITY ASSURANCE

A. The equipment furnished under this section to be supplied by 1 Equipment Company.

B. Permits and Certificates:

1. All laws, codes, ordinances and regulations bearing on the conduct of the work as drawn and specified shall be complied with and give all notices required. Any work upon which an inspection certificate by local authorities, or any governing body is required, such Inspection Certificate or Certificates shall be obtained and paid.

C. Certificates of acceptance or of completion as required and issued by the State, Municipal, or other authorities shall be procured and delivered to the Owners. The Owners may withhold payments which are due or which may become due until the necessary Certificates are procured and delivered to Owners.

D. All safety devices and all accessories required to comply with regulations and governing codes shall be provided, regardless of whether or not specified or called for in the following technical divisions of the equipment list portion of this Section of Specifications.

E. Applicable Manufacturing Standards:
1. Special fabrication items shall be manufactured in compliance with Standard No. 2 of the National Sanitation Foundation Testing Laboratory, and shall bear the NSF Seal of Approval.

F. Equipment pieces shall be manufactured in compliance with Standards No. 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 37, 51, 59 and 61, where applicable, of NSF Testing Laboratories and bear the Seal of Approval. This shall include any pending standards, which shall become applicable at the time equipment is delivered.

G. Electrical Equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA). Equipment shall have conveniently located control switches, enclosed case type, comply with State of Alabama Electric Code, and bear the label from an approved Testing Laboratory. (UL or ETL)

H. NFPA Codes 13, 17, 17A and 96 standards shall be complied with for exhaust system. Provide all safety devices on all accessories required to comply with regulation and governing codes.

I. Contractor shall be held responsible and liable for any and all changes or variances from Contract Documents, without written authorization from Architect for said changes or variances.

1.6 REFERENCES

A. The Drawings indicate the desired basic arrangement and dimensions of the equipment. Minor deviations may be substituted for approval provided basic requirements are met and no major rearrangement of service to the equipment is required to affect the proposed alteration. These deviations shall be made without expense to the Owner.

B. Operational and functional tests of the installed equipment are required. Defects or deficiencies shall be corrected to the satisfaction of the Architect or Owners at the expense of the Contractor. Consult the Mechanical and Electrical Connections Drawings and their accompanying Specifications to determine additional requirements of the work, and shall cooperate with all trades to insure a satisfactory installation.

1.7 SUBMITTALS

A. Refer to Division 1, General Requirements Section 01350 – Shop Drawings

B. Shop Drawings:
1. Verify all field measurements on the job site to insure proper fitting of all equipment. Within 30 days after award of contact, submit to the Architect for tentative approval all dimension Rough-In Drawings, drawn on a scale of ¼ inch equals 1 foot, showing and giving detailed information of mechanical and electrical utility service lines, each on separate sheets. At the same time, submit complete brochures, cuts and technical data of

manufactured items the Contractor is furnishing for the Architect's tentative approval. Within 45 days after the award of contract, submit to the Architect custom-built fabricated equipment shop drawings for their tentative approval, drawn to scale of not less than ¾ inch equals 1 foot for all special fabricated items such as worktables, sinks, dish table...etc

2. A complete submittal is required to not delay review. Rough-In drawings cannot be reviewed without cut sheets and all shop drawings requiring utility hook-ups.

3. Partial submittals shall not be accepted.

1.8 HANDLING AND STORAGE

A. Protect metal and millwork product finishes from damage during shipping, storage, handling, installation and construction of other work in the same spaces. Wrap and crate each item of equipment as needed for protection from damage.

B. Cover exposed stainless steel surfaces and millwork surfaces with self-adhesive protective paper, of a type recommended by the metal and millwork manufacturer; and do not remove until work is installed and ready for cleaning and start-up.

1.9 SCHEDULING

A. Schedules and Reports:

1. Establish earliest and latest job site delivery dates of furnished and Contractor installed items.

B. Delivery of Owner furnished equipment for installation shall take place at a time to be determined by Owners, but not necessarily during normal working hours.

1.10 SUBSTITUTION

A. Substitution of Materials and Equipment:

1. Whenever a material, article, or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade name, catalog numbers, or the like, it is so identified for the purpose of establishing a standard. Any material, article, or piece of equipment of other manufacturers or vendors which shall perform adequately the duties imposed by the general design, shall be considered equally acceptable provided, in the opinion of the Architect, it is of comparable substance, construction, appearance and function. It shall not be purchased or installed without Architect's written approval. Substitute items shall be submitted to Architect at least 10 days before bid date for review and consideration. Items that are acceptable shall be so stated in an Addendum.

1.11 WARRANTY

A. Workmanship and Guarantees:

1. Equipment shall be delivered in an undamaged condition upon completion. All workmanship and labor shall be of the best in their respective fields and skilled mechanics of the trades involved.

B. All equipment as specified in this Section shall be guaranteed for a period of one year from the time of substantial completion. If, at any time within this warranty period of one year, any equipment that is found to be faulty due to poor workmanship, inferior or defective materials, replace said pieces or correct each defective part at no cost to Owners.

1. Refrigerated items shall have an additional four-year warranty on the compressor unit. On extended compressor warranty, only labor charges after first year shall be paid.

C. At the end of first year, assign extended warranties to Owners on equipment having more than 1 year warranty from Manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless steel shall be austenitic steel alloy, and must meet the requirements of the American Iron and Steel Institute Designations for Type 201 and Type 304 Stainless steel. Type 430 Stainless steel (straight chrome - no nickel) shall not be acceptable for custom-built fabricated equipment.

B. All sheets shall have genuine mill finish of not less than commercial No. 4 on exposed side and with not less than No. 2 on unexposed side. All stainless steel shall be stretcher leveled, with thickness of:

1. 14 Gauge - Not less than 0.075 Inch

2. 16 Gauge - Not less than 0.063 Inch

3. 18 Gauge - Not less than 0.050 Inch

4. 20 Gauge - Not less than 0.038 Inch

C. Welding shall be of electric arc or oxy-acetylene gas. Welding shall be done with rod of same material and full penetration in the entire length of the joint. Welds to be flat without buckles, voids or imperfections. All welds shall be ground flush with adjacent surfaces, conditioned to eliminate dangerous surfaces. All shear cuts or bends that tend to open the surface of the metal shall be rewelded, ground and polished. All edges are to be ground and filed to eliminate sharp or rough edges.

D. When stainless steel sheets have grain running in different directions, the sheets shall be so jointed and welds run and finished in such a manner as to make the sheets appear as one continuous product.

E. Gauges:

1. All Gauges of metals, where specified, shall be manufactured to the standards set forth by the U.S. Standard for Sheet Metal.

2. Unless specified, no material shall be finished lighter than 20 gauge for custom-built fabricated equipment.

F. Sound-Deadening:

1. The undersides of dish tables shall be sound-deadened to no less than 1/8 inch thick and allowed to dry thoroughly before being finished with 2 coats of paint.

2.2 FABRICATION

A. Products manufactured by Atlanta Custom Fabricator, Low Temp and Southern Equipment Fabricator's, modified to comply with specifications, are acceptable.

B. Metal Tops for Tables:

1. Shall be constructed of 14 gauge stainless steel with butt joints welded, ground and polished smooth, resulting in a one piece top without joints

and crevices. Tops are to be reinforced by means of 14 gauge stainless steel channel irons, 1 inch by 5 inches by 1 inch. Securely fastened to underside, on 30 inch centers, by studs or welding in a vermin- proof manner. Free standing ends are to be turned down 1-3/4 inch on bull-nose edge or 2 inch rolled down edge with all exposed corners rounded on a 2-1/2 inch radius, or bull- nose corner. Where table borders on or is adjacent to wall, there is to be a 4 inch high backsplash with 1 inch turn back to wall with welded enclosed ends, unless otherwise specified. See Drawings for typical details.

2. Sleeves:
   a. Where legs, standards, pipes, or pipe chases come through a work area or table top, they shall pass through 3 inch high stainless steel sleeves, with the periphery fully welded and polished to match adjacent surfaces.

C. Cabinet Bases:
1. Tops shall be as otherwise specified for metal tops. Tops to be secured to body by concealed studs welded to underside of top. Studs to pass through holes of body frame and be securely fastened with stainless steel lock washers and nuts. Bases shall be covered back and ends with continuous sheets of 18 gauge stainless steel, folded into front opening. Cabinet shall have 2 shelves, 1 lower and 1 intermediate. All shelves shall be constructed of 16 gauge stainless steel and shall be fixed type. Bases shall be supported on 8 inches high legs NSF approved stainless steel legs with adjustable stainless steel bullet feet.

D. Sinks:
1. Shall be constructed of 14 gauge stainless steel sheets with all interior corners rounded on at least a 1/2 inch radius. All bottom corners shall be fully coved. All joints to be welded, ground, polished and made to match adjacent surfaces. Provide each sink with a 2 inch chromium plated waste outlet with a stainless steel strainer and Chromium Plated tailpiece. Provide with a rotary lever handle waste valve. Wastes are to be depressed in sink bottoms with bottoms inclining down towards the wastes. Waste for pot sink shall be rotary Model No. 28940 Fisher; chrome draining, flat strainer with overflow. Wastes for prep sinks shall be rotary Model No. 27932 Fisher, chrome draining or approved Model by Component Hardware Group, Inc and T & S Brass and Bronze Works. Rotary handle shall have front stainless steel bracket support welded to underside of sink compartment. Backsplash against wall shall be 8 inches high with 2 inch turned back on 45 degree angle with enclosed welded ends. Support sinks on legs and gussets, as specified, with braces from front to rear only. See Drawings for backsplash typical details.

2. All backsplashes against wall shall be sealed with clear Polysulphide Sealant.

3. Each compartment shall have cut-out on rear to accommodate overflow assembly provided with drain assembly. Overflow and drain assemblies shall be installed and made watertight.

E. Wall Shelves:
1. Wall Shelves shall be fabricated of 16 gauge stainless steel and same construction as "Overshelves". Secure brackets to wall with stainless steel screws with expansion shields. Brackets shall be spaced on a maximum of 4 feet on center.

2. Wall shelves may shall be supported on table's extended rear legs with cantilevered supports of 14 gauge stainless steel flag brackets.

F. Legs, Braces, Gussets, Feet:

1. Height of tables and other fabricated items of equipment shall be as specified. Legs shall be of 1-5/8 inch outside diameter, stainless steel 16 gauge tube spaced at intervals of 5inch-6 inch centers.

2. Legs are to be braced by 1-5/8 inch outside diameter stainless steel 16 gauge tube undershelf, welded to legs., 10 inches above the floor. Weld all around periphery at joint to legs and grind smooth. The braces shall be constructed to form rectangular, or "H" frames, and there shall be at least one brace welded to each leg.

3. Gussets shall be stainless steel NSF approved, cylindrical type with setscrew. Leg gussets are to be welded to underside of tables, to reinforcing channels, and underside of sinks. Gussets shall be Model No. A20-0206 manufactured by Component Hardware Group Inc. or comparable stainless steel gussets manufactured by Standard-Keil Hardware Manufacturing Company, United Showcase, Component Hardware and Kason Food Service.

4. Feet shall be stainless steel adjustable bullet shape, fully enclosed, tightly fitting the leg. Provide 1 inch up and down adjustment from the central position, at no time exposing any threads. Adjustments are to be easily made by hand without the use of tools. For counters and cabinet bases, the feet shall be the same as for above. Feet having comparable quality to Component Hardware Group, Inc. and Kason Food Service are approved. Legs for cabinet base shall be 8 inches high, including feet. Freestanding sinks shall be supported on legs and feet as specified, with bracing from front to rear only.

5. Where flanged feet are specified, provide stainless steel flanged feet, which can be securely fastened to floor.

G. Rough Edges:

1. All ends and edges which are rough or sharp shall be filed and ground to a safe smooth finish before delivery to job site.

2.3 MISCELLANEOUS ACCESSORIES

A. Stainless Steel Enclosures:

1. Provide 20 gauge stainless steel trim to fill in wall openings at Pass-Thru Cabinets. Trim will overlap wall by approximately 2 inches and be within 1/2 inch of cabinets on side. Provide for a 3 inch opening between top of cabinet and wall.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND INSTRUCTION MANUALS

A. At a time as designated by the Architect or Owners, demonstrate the operation, care, and minor maintenance of equipment supplied. Supply the Architect with an affidavit signed by the Owners or Food Service Manager/Director that this service was rendered and performed.

B. At the start of operation, devote 1 full working day monitoring all equipment operation. The purpose of this day is to ensure equipment is in proper working order at start.

C. Coordinate start-up of equipment with testing and balancing of HVAC system. Ensure that HVAC will be operating properly even during maximum equipment use.

D. Submit to Owners at time of demonstrations 2 complete booklets, in hard binders, containing:

1. Instructions.

2. Warranties.

3. Parts list of all bought out items provided under this section.

4. List of names, addresses and telephone numbers of local authorized servicing agencies.

5. Where available, provide DVD's of all equipment specified. The videos are to show and detail proper care and maintenance of equipment.

3.2 FIELD MEASUREMENTS

A. Field measurements shall be made, giving due consideration to any Architectural, Mechanical, or Structural discrepancies which may occur since this is an existing structure to remain. No extra compensation shall be allowed for any difference between actual dimensions secured at the job site and the measurements indicated on the Contract Drawings. Field verify all dimensions.

B. Any differences that may be found during field measurements shall be submitted to the Architect for consideration before proceeding with the fabrication or supplying of any equipment.

3.3 INSTALLATION

A. Dispose of all packaging and debris per 01 7419 Construction Waste Management Plan.

B. Make arrangements for receiving equipment and make delivery into the building. Do not consign any equipment to the Owners or to any other Contractor unless written acceptance from them and satisfactory arrangements have been made for the payment of freight and all handling charges.

C. Deliver all equipment into the building, uncrate, assemble, level and repair any damaged or abraded surfaces. Set equipment temporarily in its final locations, permitting the mechanical and electrical trades to take necessary measurement for the connection of the service lines; then move the equipment sufficiently to permit the installation of such service lines. After which realign equipment level and plumb, making the final erection as shown on the Contract Drawings. All equipment shall be installed so as to eliminate objectionable vibration.

D. Contractor shall have a competent Equipment foreman on the premises to assist in furnishing information and supervising installation of Equipment under this section. This foreman shall verify correct locations for Rough-Ins.

3.4 LUBRICATION - OIL AND GREASE

A. Each moving part in the entire food facilities installation shall be provided with suitable bearings with provision for greasing, or with grease gun connections suited to a high-pressure gun for distributing heavy oil or light grease. Points of lubrication shall be readily accessible.

3.5 CONCESSION EQUIPMENT

A. It is the responsibility of the equipment dealer to ensure that any products by manufacturers listed as being acceptable to the prime specification, in fact, meet the design and performance specifications of the prime specification in every way.

B. The intent of the prime specification is to set forth the level of quality and features/options that are desired by the owner. All features and options of the prime specification must be included with and product substituted from the list of approved manufacturers.

C. Reference Floor Plan for location of equipment.

1. WORK TABLE

a. Provide fabricated, stainless steel Work Table, size and shape as shown on Drawings. Provide with 16 ga. stainless steel undershelf.

b. Where adjacent to wall provide with a typical 8 inch high backsplash with 2 inch turnback on 45 degree angle with enclosed welded ends. Front and sides to have marine edge. Refer to Drawing for typical tabletop construction details.

c. Field Verify Space before Fabrication.

d. At Pass-thru window, provide continuous, seamless countertop with beveled edges.

2. WALL SHELF

a. Provide fabricated 16-gauge, stainless steel Wall Shelf. Wall Shelf to be size and shape as shown on drawings.

b. Unit to be mounted and located 24" above the working surface of Item No. 54, Prep Table with Sink.

c. Shelf sides and rear to flange up 2". Front to have 1-1/2" rolled down edge. Support Shelf on wall by heavy gauge stainless steel brackets or by approved alternate means.

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 (FE)

A. 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.

B. 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

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 Existing Conditions
A. It is the general contractor's responsibility to field verify existing signage before a bid and provide signage that shall match all existing signage types and styles currently installed to provide a continuity of design to the owner as required.

1.3 Submittals
Shop drawings shall be submitted.

2.0 - PRODUCTS

2.1 Building Letters
Cast aluminum letters, equal to Leeds Architectural Letters, Inc., Select from all available fonts. Size: As indicated on drawings, 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 KnoxBox
Provide one Standard Capacity Model 3274 KnoxBox 3200 - Location as directed by the Architect
* Color: (Aluminum, Black, Dark Bronze) Choose One
* Mount Type: (Recessed Mount, Standard Mount) Choose One
* Tamper Switch Type: (None - Fire Alarm/Panel - Security Alarm) Choose One

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 600lbs. without use of cross brace.

2.4 Fabrication:
A. 1. 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.

2. Exposed ends:
Faced with VGS high-pressure decorative laminate.

3. Wall unit bottom:
Faced with thermally fused melamine laminate. (non-exposed areas only)

4. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

B. 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.

2.5 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

SECTION 13125 – SOFTBALL- ALUMINUM BLEACHER AND PRESS BOX

1.0 – GENERAL

1.1 Related Documents
Drawings and general provisions of the Contract; including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 Scope Of Work
Provide labor, materials, equipment, engineering, installation to provide a new custom aluminum bleacher system in accordance with the following specifications:

A. Minimum acceptable criteria:

1. Design per plan view and sectional view drawings.

2. The overall length of grandstand shall be as per architectural drawings.

3. The number of rows shall be as per architectural drawings.

4. Height of front walkway from grade shall be as per architectural drawings.

5. Width of front walkway to be as per architectural drawings.

6. The rise per row shall be as per architectural drawings.

7. The depth per row shall be as per architectural drawings.

8. Net seating capacity shall be as per architectural drawings.

9. The riser shall be structurally connected to the decking system panel every 18" longitudinal with ¼" diameter structural grade rivet.

10. There shall be no gaps or cavities between the riser portion of the decking system and any supports or attachments.

11. ADA seating shall be as per architectural drawings.

12. Aluminum extrusions using alloy 6063-T6 and 6061-T6.

13. Understructure members shall be constructed using square tube and aluminum angle extrusions. Vertical columns should have a dimension of 2" x 2" and a minimum wall thickness of 1/8" on all columns except the terminal column which should be 3"x 2". The footboard supports and bases angles should be 2" x 1.1/2"x 3/16" aluminum angle. All diagonal bracing should be 1.1/2" x 1.1/2" x 3/16" aluminum angle.

14. All mating connections to create the understructure framing system shall be welded connections and shall be welded on all sides.

15. All welded connections shall be by certified aluminum welders

16. All understructure frames shall be treated after fabrication by a system that employs a commercial cleansing and rinse procedure.

17. Aisle and Egress stairs shall have a ½" overlap.

18. At locations where platforms meet end to end a beveled four inch wide aluminum threshold extrusion shall be provided to cover the walking surface.

19. Seat support system shall be universally adjustable to any location on the vertical plane of the decking system.

20. All seat support, aisle step supports, aisle handrails and risers shall be installed from the topside of the decking system. There shall be no through bolting of these items through the riser system.

21. Guardrail system shall be constructed with all-aluminum support posts and railings with 9 Ga. **Black Vinyl** coated chain link fencing.

22. Bleacher manufacture must have a written quality control program for manufacturing, shipping and installation.

23. Walking surface shall be fluted non-skid and slip resistant.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in place Concrete" for concrete mix design and testing requirements.

1.3 System Performance Requirements

A. General: Provide a complete, custom bleachers system mutually dependent components and assemblies that form a custom system capable of with standing structural and other loads, thermally induced movement, and exposure to weather without failure. Include primary and secondary framing, decking system, seating, handrails /guardrails, press box and accessories complying with requirements indicated, including those in this Article.

B. Structural Performance: Provide bleacher system capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Design Loads / Structural – Framing Members
      a. Dead Loading: 6 PSF for understructure
      b. Live Loads: 100 PSF for understructure
   2. Design Loads / Decking System
      a. Dead Loading: 6 PSF for decking, platforms, stairs and ramps
      b. Live Loads: 100 PSF for decking, platforms, stairs and ramps

c. Deflection Limits: engineer assemblies to withstand design loads with deflections no greater than the following:
   1) Decking, platforms, stairs and ramps: vertical deflection of L/360

d. Sway loads of 24 PLF per row parallel to seat and 10 PLF per row perpendicular to seat run.

3. Design Loads / Handrail / Guardrail
   a. 100 PLF Vertical

   b. 50 PLF applied in any direction

   c. 200 LB Concentrated load any direction

   d. 50 PSF fencing and infill

4. Design Loads / Seat Boards
   a. Live Loads: (vertical) 120 pounds per lineal foot

1.4 Submittals

A. Shop Drawings: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following grandstand system components:
   1. Foundations:
      a. Footings, slab and reinforcement.

   2. Structural framing:
      a. Primary and secondary framing including but not limited to the following:
         1.) Vertical & Horizontal Members
         2.) Bracing
         3.) Connecting hardware

   3. Tredweld Decking System:
      a. Decking Platforms
      b. Risers
      c. Supports for Seats
      d. Aisle Steps
      e. Aisle Handrails
      f. Egress Stairs
      g. Hardware

   4. Seating

   5. Handrails / Guardrails

   6. Ramps

1.5 Quality Assurance

A. Concrete Installers Qualifications: An experienced installer who has completed concrete work similar in material, design and extent indicated for this project and whose work has resulted in construction of bleacher system with a record of successful in-service performance.

B. Erector Qualifications: An experienced erector who has specialized in installing bleacher system similar in material, design, and extent to that indicated for this Project. Bleacher erector must be certified by bleacher manufacturer.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of bleacher systems that are similar to those indicated for this Project in material, design and extent. All approval drawings shall bear the seal of a registered professional engineer in the state of installation.

D. Quality Control: Manufacturer's written quality control for manufacturing, shipping and installation shall be submitted prior to award of contract.

E. Standards and Guidelines: Comply with the provisions of the following codes, specifications and standards, latest editions, except as otherwise noted or specified:
   a. American Concrete Institute (ACI)
   b. Aluminum Association of American
   c. American Welding society (AWS)
   d. Americans with Disabilities Act (ADA)
   e. International Building Code (IBC)
   f. International Code Council 300 (ICC 300)

F. Site visitation: Bidder shall visit the job site prior to the bid date. At the time of visitation, bidder must verify site conditions.

1.6 Delivery, Storage And Handling

A. Package all items for protection during transportation and handling.

B. Do not store items on the job site in contact with other materials that might cause staining, denting or other surface damage.

1.7 Warranty

A. All products shall carry, after proper erection, and under normal use for the type of structure a one (1) year warranty against all defects in materials and workmanship.

2.0 - PRODUCT

2.1 Manufacturer

A. Structural Aluminum Framing Members and Aluminum Decking System Outdoor Aluminum, Inc. (Basis of design)

B. Other Manufacturers should submit request and data ito the Architect at least 10 days prior to bid in conjunction with Section 01360. Approval shall be in writing via Addendum. (Submit to rfi@lathanassociates.com)

2.2 Concrete Foundations

A. Foundations shall be designed in accordance with mix designs.

B. Foundations shall be flat and level concrete slab.

2.3 Understructure:

1. The understructure of the system shall consist of a series of aluminum square tube and angle frames spaced at intervals of no more than 6-0' and joined by means of aluminum sway braces.

2. Each stringer shall consist of vertical members, adequate diagonal braces, and horizontal members welded to form the proper rise per row and proper back to back spacing between seat rows.

3. All welded connections shall be by certified aluminum welders, and all mating parts shall be welded on all sides to assure adequate strength.

4. Vertical members shall be constructed on 2" x 2" x 1/8" square tube aluminum for all columns except the terminal column which should be 3" x 2" x 1/8" square tube aluminum, alloy 6061-T6, mill finish.

5. Horizontal members shall be constructed of 2" x 1.5" x 3/16" aluminum angle, alloy 6061-T6, mill finish.

6. Sway braces shall be constructed of 1.5" x 1.5" x 3/16" aluminum angle, alloy 6061-T6, mill finish

2.4 Decking System:

A. Decking System Platforms shall consist of extrusions laid side by side to form the tread width. These individual extrusions are then clamped and factory fixture welded. The treads shall be welded in a single pass with .0035 diameter 4043 welding wire, using argon gas. This method will result in a rigid, positively joined tread. Individual tread lengths shall be a maximum length of 37'-6" with the actual length designed to create the minimum number of expansion seams. Decking shall be attached to the supporting aluminum tube understructure by means of concealed aluminum clips, galvanized bolts, washers and nuts.

B. Platforms shall have a minimum aluminum wall thickness of .078" and aluminum shall be alloy 6063-T6.

C. Walking surface shall be fluted non-skid and slip resistant.

D. The rear portion of the platform will turn ninety degrees vertical to accept the next row of decking platforms. The front portion of the platform shall be complete with a female front edge to allow for a positive male / female connection of a vertical riser.

E. At locations where platforms meet end to end a beveled four-inch-wide aluminum threshold extrusion shall be provide to cover the walking surface. Threshold shall be beveled on both sides so as not to create a trip hazard and must have a fluted surface to prevent slipping. Threshold must comply with specified deflection criteria and once installed must allow for expansion and contraction.

F. Decking System Riser

1. The decking system riser shall be extruded aluminum; alloy 6063-T6 with a 204 R1 anodized clear finish. **Aisle step risers to be powder-coated in school colors**

2.3 Understructure:

1. The understructure of the system shall consist of a series of aluminum square tube and angle frames spaced at intervals of no more than 6-0' and joined by means of aluminum sway braces.

2. Each stringer shall consist of vertical members, adequate diagonal braces, and horizontal members welded to form the proper rise per row and proper back to back spacing between seat rows.

3. All welded connections shall be by certified aluminum welders, and all mating parts shall be welded on all sides to assure adequate strength.

4. Vertical members shall be constructed on 2" x 2" x 1/8" square tube aluminum for all columns except the terminal column which should be 3" x 2" x 1/8" square tube aluminum, alloy 6061-T6, mill finish.

5. Horizontal members shall be constructed of 2" x 1.5" x 3/16" aluminum angle, alloy 6061-T6, mill finish.

6. Sway braces shall be constructed of 1.5" x 1.5" x 3/16" aluminum angle, alloy 6061-T6, mill finish

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A. Decking System Platforms shall consist of extrusions laid side by side to form the tread width. These individual extrusions are then clamped and factory fixture welded. The treads shall be welded in a single pass with .0035 diameter 4043 welding wire, using argon gas. This method will result in a rigid, positively joined tread. Individual tread lengths shall be a maximum length of 37'-6" with the actual length designed to create the minimum number of expansion seams. Decking shall be attached to the supporting aluminum tube understructure by means of concealed aluminum clips, galvanized bolts, washers and nuts.

B. Platforms shall have a minimum aluminum wall thickness of .078" and aluminum shall be alloy 6063-T6.

C. Walking surface shall be fluted non-skid and slip resistant.

D. The rear portion of the platform will turn ninety degrees vertical to accept the next row of decking platforms. The front portion of the platform shall be complete with a female front edge to allow for a positive male / female connection of a vertical riser.

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F. Decking System Riser

1. The decking system riser shall be extruded aluminum; alloy 6063-T6 with a 204 R1 anodized clear finish. **Aisle step risers to be powder-coated in school colors**

2. This extrusion shall have a male ridge running continuous at the upper leading edge to interlock with the front portion of the decking system panel.

3. The riser shall be structurally connected to the decking system panel every 12" longitudinal with ¼" diameter structural grade rivet.

4. There shall be no gaps or cavities between the riser portion of the decking system and any supports or attachments.

G. Decking System Seat Supports

1. The decking system seat support shall be of extruded aluminum angle.

2. Once installed the seat support shall have no noticeable gaps between the decking system riser and support.

3. Seat support system shall be universally adjustable to any location on the vertical plane of the decking system.

H. Decking System Aisle Handrails

1. The decking system aisle handrails shall be 1-5/8" schedule 40 anodized aluminum pipe.

2. Handrails shall have a center line handrail and the spacing between rails shall not be less than 22" or more than 36". Handrails shall be discontinuous and shall not span more than five rows of seating.

I. Decking System Egress Stairs

1. The decking system egress stair stringers are to be constructed of 8" aluminum channel, alloy 6061-T6. Tread supports to be welded to 8" member to totally cap the end of the 2" x 12" stair tread against the channel web.

2. Walking surface of tread shall be complete with female front edge to allow for positive male / female connection of the riser closure. All risers to be fastened to the rear tail of the stair tread with ¼" diameter structural grade rivet.

3. Stair tread nosing to be anodized black. Nosing shall have no external fasteners.

4. Stair grab rail to be constructed of 1-5/8" schedule 40 anodized aluminum pipe with no fittings at transition from sloped system to grade.

J. Decking System Hardware

1. All bolts, washers and nuts shall be galvanized.

2. End caps shall be of a heavy duty, clamping, aluminum channel design fastened to the ends of extrusions with aluminum rivets. End caps shall close all end openings of extrusions and shall be a full-length piece and match in both color and finish the extrusion to which they attach.

3. All riser fasteners shall be structural ¼" diameter structural grade rivet.

2.5 Seating

A. Bench Seating

1. Seats shall be of extruded aluminum with a fluted non-skid surface, alloy 6063-T6, with 204R1 anodized clear finish

2. Plank shall be 2" by 10" nominal with a wall thickness of .078" (+ / - .006" industry tolerance) at the smooth surface.

3. Finish size shall be 1-3/4" by 9-1/2"

4. Seats shall attach to the decking system seat supports by means of concealed aluminum clips, galvanized bolts, washers and nuts.

5. Seat supports shall be installed on centers that will allow for the same design deflection criteria required by code.

6. End caps shall be of extruded aluminum and shall match in both color and finish the plank to which they attach. All end caps shall be single piece and shall attach to the underside of the plank with a minimum of two aluminum rivets.

B. VIP Seating – Deck mounted Equal to Interkal Slat back Aura Chairs.

2.6 Handrails / Guardrails

A. All railing shall consist of 1-5/8" schedule 40 anodized pipe.

B. All pipe fittings shall be of cast aluminum.

C. Guardrail supports to be 3" aluminum channel, alloy 6061-T6.

D. Rail pipe shall be secured to the guardrail support by means of galvanized tension bands.

E. The top rail shall be 42" minimum above the nearest seat on the sides and rear, and 42" above the tread on the front walkway.

F. Handrails on stairs shall be 34" above the leading most edge of the stair tread.

G. Black vinyl chain link fence shall be provided on the front, sides and rear of the grandstand and at all egress areas.

H. Handrails shall be provided at all walking areas and shall extend 1-1/2" from guardrail material. Standoff shall be extruded aluminum, alloy 6061-T6

I. Handrails shall have internal sleeves for splice purposes and finished rail shall be continuous and shall not exceed 1-5/8" diameter.

2.7 Ramps

A. Wheelchair accessible ramps with a minimum 60" clear width

and a maximum 1:12 slope shall be provided at both ends of the walkway, conforming to code.

B. Understructure shall be constructed of same materials as bleacher support structure.

C. Decking and handrails shall be constructed of same materials as bleacher decking.

2.8 Vertical Closure System

1. Corrugated Aluminum Wall Panel
   a) Riser closure shall consist of an overlapping configuration of 8"x0.100" wall thickness 6063-T6 aluminum extrusions, with a 1" forward facing corrugation.
   b) Riser overlap shall be ½" min. and 2" max.
   c) Riser closure to span between rail post spaced at 6'-0" c/c.
   d) Aluminum top cap to be provided where gaps are created between top of closure and decking walking surface.
   e) Closure to be attached to rail post with stainless steel mechanical screws.
   f) Finish – Powder Coated

3,0 – EXECUTION

3.1 Examination

Before erection proceeds, certified bleacher installer will survey elevations and locations of concrete pads or runners to verify compliance with requirements and bleacher manufacturer's tolerances.

3.2 Erection

A. Erect bleacher system according to manufacturer's written instructions and erection drawings.

B. Do not field cut, drill or alter structural members without written approval from bleacher system manufacturer's professional engineer.

C. Set structural framing in locations as indicated.

3.3 Cleaning And Protection

A. Clean all metal surfaces promptly after installation of work.

B. Exercise care to avoid damage to protective coatings and finishes.

C. Remove all excess construction material and dispose of all debris.

4.0 -PRESS BOX

8' x 12' Press Box

Design Codes
Per IBC 2015

Design Specifications
Roofing: 100 psf live load
10 psf dead load
30 psf wind

Walls: 25 psf vertical projection
8 psf dead load

Floors: 100 psf live load
10 psf dead load

Occupancy Group: B

Construction Type: 5B

4.1 General:

1. Contents of this submittal show the intended application of cold formed framing components. Framing erector is to refer to the project contract documents for additional construction assembly requirements.

2. Dimensions shown herein have been determined per the contract documents and are for design reference only. All conditions shall be verified prior to erection.

3. This submittal is also subject to the review and conceptual approval of the project engineer and/or architect prior to erection.

4. For specific requirements and warranty information for systems or materials connected and appurtenant to the cold-formed steel framing including windows, caulking and flashings, refer to manufacturer's data.

5. Details of the wall finishes are for arrangement ANS reference. For specific requirements, methods, materials and execution standards, refer to technical data from product manufacturer. In the event of conflict, manufacturer's instructions shall dictate.

4.2 Installation:

1. All framing components shall be cut squarely for attachment to perpendicular members or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.

2. Temporary bracing shall be provided and remain in place until work is completely stabilized.

3. All cutting of studs must be done by sawing or shearing. Torch cutting of cold-formed members is unacceptable.

4. When required for bridging purposes, framing fabricator is to ensure punch-out alignment when assembling framing and field cutting studs to length.

5. No splices in studs, joists or other load carrying members may be made without prior engineering review and specific details for any such splice(s).

6. Where splicing of wall track is necessary between stud spacings, a piece of stud shall be placed in the adjoining track sections and fastened to the track flanges at both sides of the wall or the tracks shall be butted tight together and fastened to structure either side of the joint.

4.3 General Notes:

1. Material substitutions may be made by Outdoor Aluminum, Inc. with materials of equal or better specifications depending on material availability.

2. Material substitutions or color selections made by customer may require a price adjustment.

3. All floor deck, roof deck, interior wall coverings, exterior wall covering, and joints are glued in addition to nailing and screwing for greater strength and durability.

4. Door location, window size, roof scuttle location and interior wall location may vary according to customer requirements.

5. Quality is applied everywhere throughout the construction of the unit. Unit is guaranteed for (1) year against defective material and workmanship.

4.4 General Contractor Responsibility:

1. Compliance with all local codes, ordinances, zoning requirements, and all applicable permits.

2. Temporary job site electric service.

3. All utility hook-ups to the unit.

4. Permanent electric service to the panel box.

5. Provide access to site as required for all vehicles and equipment as required to deliver and set press box.

4.5 Materials:

1. All 18 ga. and lighter members, and all track, bridging and accessory items shall be formed from steel meeting the criteria as listed above, with a minimum yield strength of 33 KSI unless specifically noted otherwise.

2. Structural Properties and capacities of steel framing components shall be in accordance with the A.I.S.I. cold-formed design specification.

3. All framing products shall be formed from steel possessing a zinc coating corresponding to the minimum requirements of ASTM A653.

4. Structural properties used in this submittal are those published by The Light Gage Institute.

   A. Floor Deck:
      1) Floor joist: 6" x 18 ga. steel longitudinal joist @ 16" o/c.
      2) Bottom Sheathing: ½" CDX plywood.
      3) Underpan: 26 ga. galvanized steel.
      4) Floor Decking: ¾" T&G plywood floor decking (APA rated).
      5) Insulation: Batt R-19.

   B. Walls:
      1) Studs: 3.½" x 18 ga. steel studs @ 16" o/c.
      2) Interior Paneling: 5/8" vinyl coated sheetrock as manufactured by Gold Bond.
      3) Exterior Siding: ½" CDX plywood sheathing, Rex Wrap as manufactured by Alpha Protech, home wrap (or equal) and 26

gauge metal R-panel as manufactured by All Metal Roofing & Siding Inc. (or equal). Color to be selected from standard color chart.

4) Insulation: Kraft faced R-11.

C. Roof:

1) Joist: 6" x 18 ga. steel roof joist @ 12" o/c - (Note: Joist size or ga. may vary depending on span).
2) Roof Decking: ¾" T&G 5 ply CDX plywood roof deck sheathing.
3) Fascia: Formed Pre-finished, (White) 26 gauge metal (same stock as siding).
4) Soffit: Formed Pre-finished, (White) 26 gauge metal (same stock as siding).
5) Roofing: 0.045 EPDM rubber, single ply, black membrane.

D. Doors and Windows:

1) Exterior Doors: 3'-0" x 6'-8" insulated, steel doors by Mesker Doors (or equal) out swing with approved hardware. Door to have a louver for airflow Thresholds, jambs and trim as required. Door(s) to utilize all appropriate hardware as manufactured by PDQ Manufacturing. Door knobs to be keyed alike.
2) Windows: vinyl framed, horizontal sliders, ½" insulated glass w/screens - white.
3) Prefinished embossed vinyl window and door trim casing on interior.
4) Exit sign above each door.
5) Emergency lights in each room.

E. Electrical:

1) All work shall meet National Electrical Code and shall be performed by licensed Electrical Contractor.
2) 100 amp main breaker panel.
3) Outlets: one wire mold duplex outlet every 8'-0" on back wall, Wire Mold 2000 series plug strips (or equal) with receptacle every 18" under windows on front wall.
4) All wiring above ceiling to be run in conduit or concealed in decorative wire molding, fully accessible.
5) Lights: fluorescent four bulb recessed lights suspended in ceiling, spaced 8'-0" on center - minimum (1) in each room.
6) All components to be UL listed.

F. Flooring:

1) Tarkett 12" x 12" x 1/8" thick vinyl composition commercial tile Beige Taupe 1345 (or equal).
2) Vinyl cove base trim at perimeter edges.

G. Ceiling:

1) Suspended ceiling, with acoustical tile panels
2) Insulation: R-19 FS25 Fire Stop, complying with ASTM C665 requirements.

H. Counter:

1) Premolded laminate counter top Wilson Art Heritage Style, Almond Leather 2932-60 (or equal) with end splashes, shelf shall be 22" deep, elevated 30" above floor, and shall be the

continuous length of the building, support brackets on 32" centers.

GADSDEN, AL (136 MPH Vult; 105 MPH Vasd)
Two 8'-0" x 12'-0", MFE Type #1, wood-framed prefab modular press box for Gadsden State Community College, Gadsden, AL. The press box will ship to the site on a one-way disposable carrier.

The layout is wide-open with an 18ga. insulated galvanized steel entry door with steel frame and an illuminated exit sign at one end. The exterior door shall be equipped with a commercial lever handled lockset. Also included is a GE Zoneline packaged terminal HVAC unit with an integral thermostat.

Other features include 5/8" vinyl-faced gypsum interior wall panels, 5/8" fire-rated gypsum interior ceiling panels taped and bedded with spray-textured finish, house wrap air infiltration barrier, 26ga. ribbed steel exterior siding panels with Kynar 500 finish, PGT "WinGuard", hurricane rated horizontal slider windows, 5400 Series Wiremold dual-channel electrical raceway, SATCO LED light fixtures, 2x6 wall construction and plastic laminate faced counter.
Estimated weight: 6,000 lbs.

All windows, doors, exterior components and exterior cladding shall comply with the prevailing hurricane wind design loads.

END OF SECTION 13125

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END OF SECTION

PART 1 GENERAL

1.01 SCOPE

A. HVAC means Heating, Ventilation and Air Conditioning.

B. Provisions of this Section apply to all HVAC and Building Management and Control System (BMCS) work.

C. Include the provisions of General, Supplementary and Special Conditions and provisions of the Specifications shall apply to and form a part of this Section.

D. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, except work specifically specified to be done or furnished under other sections of the Specifications. Include performing all operations in connection with the complete HVAC installation in strict accordance with the specification and applicable drawings subject to the terms and conditions of the Contract.

E. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.

F. "Provide" means to furnish and install, complete and ready for operation.

G. All equipment shall be U.L. or E.T.L. listed as an assembly.

1.02 DRAWINGS

A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work. Coordinate with Architectural, Structural, Electrical, Plumbing and other Building Drawings.

B. Follow the Drawings closely, check dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC Drawings for location of system components.

C. Do not scale Drawings to locate ceiling diffusers. Coordinate with lighting, ceiling grids and/or reflected ceiling plans.

D. Drawings and Specifications are complimentary. Work shown on the drawings or specified in the specifications is binding as if shown or specified on both. Any discrepancies between the drawings and specifications shall be brought to the attention of the Consultant for clarification during the bidding process. Discrepancies shall be addressed via a written Request for Information and answers from the Consultant will be issued by Addendum prior to bidding.

1.03 APPLICABLE CODES AND STANDARDS

A. Comply with the current editions of the following Codes and Standards:
   1. ANSI/ASHRAE 15 - Code for Building Services Piping.
   2. ANSI B9.1 - Safety Code for Mechanical Refrigeration.
   3. ASME Boiler and Pressure Vessel Code.
   4. NFPA 54 - National Fuel Gas Code.
   5. NFPA 30 - Storage of Flammable Liquids.
   6. NFPA 31 - Oil Burning Equipment.
   7. NFPA 99 - Health Care Facilities.
   8. NFPA 70 - National Electrical Code.
   9. NFPA 90A - Air Conditioning and Ventilating Systems.
   10. NFPA 91 - Blower and Exhaust Systems.
   11. NFPA 96 - Commercial Cooking Equipment, Vapor Removal.
   12. NFPA 101 - Life Safety Code.
   13. Current Edition of SMACNA – HVAC Duct Construction Standards.
   14. Other Standard as referenced in other Sections of Division 23.
   15. Local Building Code (International Building Code if no local Building Code in effect).

16. Local Plumbing Code (International Plumbing Code if no local Plumbing Code in effect).
17. Local Gas Code (International Gas Code if no local Gas Code in effect).
18. Local Mechanical Code (International Mechanical Code if no local Code in effect).

1.04 QUALIFICATIONS OF SUBCONTRACTOR

A. The HVAC Contractor shall meet the following qualifications:
   1. The HVAC Contractor shall have been in business as a HVAC Contractor for at least three (3) years prior to Bid Date. The HVAC Contractor shall have held a license from the State Licensing Board for General Contractors for at least three (3) years prior to Bid Date.
   2. The HVAC Contractor shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project and have completed five projects of the same cost (or more) as the cost of this project, and for at least three (3) years prior to the Bid Date shall have had an established service department capable of providing service inspection or full maintenance contracts.
   3. Contractor must have bonding capacity for project of this size and must bond the project, if required by the General Conditions of the contract.

1.05 CONFLICTS AND INTERFERENCES

A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

B. Make no changes without the Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work in proper manner.

1.06 WORKMANSHIP

A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.07 COOPERATION

A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

B. Coordinate construction of all Mechanical work with Architectural, Structural, Civil, Electrical Work, etc. as shown on other contract documents.

1.08 VISITING SITE

A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

B. Any discrepancies or interferences shall be reported immediately to the Architect.

1.09 SCHEDULED WORK HOURS AND FACILITY OCCUPANCY

A. Schedule all connections to existing systems and shutdowns with the Owner.

PART 2 PRODUCTS

2.01 MATERIALS, SUBSTITUTIONS AND SUBMITTALS

A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Equipment and materials furnished shall be fabricated by manufacturer regularly engaged in their production and shall be the standard and current model for which replacement parts are available. HVAC equipment shall be substantially the same equipment of a given manufacturer which has been in successful commercial use and operation for at least three (3) years.

B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the Bid, and shall be furnished under the Contract unless requests for substitutions are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.

C. Substitutions will be considered only if written request for approval has been received by the Architect ten (10) days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which substitution is proposed, specification section/paragraph number and a complete description of the proposed substitute including drawings, cuts, performance and test data, samples and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

D. If the Architect approves any proposed substitution prior to receipt of Proposals, approval will be set forth in an Addendum. Do not rely upon approvals made in any other manner. Prior approval to be secured for "equal" or "approved equal" manufacturer.

E. No substitutions will be considered after the Contract has been executed, except as described in the General Conditions.

F. Provide submittal in PDF format for each specification section. Refer to each specification section for submittal requirements. Before ordering materials and equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Number of Shop Drawings and procedure shall be as directed by the Architect.

G. Architect and / or Engineer's approval of submittal data does not relieve the contractor of his responsibility to comply with the contract documents.

H. It is the responsibility of the Mechanical contractor to coordinate all Electrical requirements of the submitted equipment with the Electrical Contractor. Any increase in cost due to a variance between the contract documents and the submitted equipment shall be the responsibility of the Mechanical Contractor.

I. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.

J. Similar items of equipment shall be the product of the same Manufacturer.

K. See section, "ALTERNATES" in other section of the Specifications and Bid accordingly.

2.02 SHOP DRAWINGS

A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn not less than 1/4"= 1'-0" scale. Submit one (1) set of shop drawings in PDF format.

1. For ductwork shop drawings, do not scale diffuser locations, coordinate with ceiling grids and lighting layout.

2.03 RECORD DRAWINGS

A. When work starts, obtain white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.

B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one (1) complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this Contract.

C. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.

D. When work is completed Contractor shall purchase from the Architect (At Architects' printing cost) one (1) set of prints of HVAC Drawings for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to record drawings, removing all superseded data in order to show the actual completed conditions.

1. Accurately shown location, size and elevation of new exterior piping work and its relationship to any existing piping and utilities, obstructions, etc., contiguous to the area of work.
2. Block out areas modified by change-order and identify them by change-order number.

E. Ductwork and Control Drawings may be a set of printed shop drawings or in PDF format, up-dated to show actual conditions at completion of work.

F. HVAC piping drawings may be prepared as noted in paragraph "D" above, or HVAC piping may be added to the ductwork shop drawings as noted in paragraph "E" above.

2.04 ACCESS DOORS:

A. Doors in non-fire rated walls and ceilings: 17-gauge steel with hinges and screwdriver latches, Bilco, Milcor, Miami-Carey, or equal. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance, minimum size 18" X 18".

B. Mark lay-in ceilings with stick-on label (white label with black text) at maintenance access points. Label shall be placed on ceiling grid.

2.05 ELECTRICAL EQUIPMENT

A. Verify current characteristics before ordering equipment.

B. Should the Contractor with the Architect's/Engineer's approval make changes in electrical equipment from those shown on the Electrical Drawings, he shall be responsible for the coordination and cost of required changes.

C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

D. Verify electrical characteristics of all equipment and voltages available with Electrical Section prior to ordering any electrical equipment.

PART 3 EXECUTION

3.01 SITE VISITS

A. Mechanical contractor shall have a representative available for all on-site meetings requested by the Engineer and for all regularly scheduled in-wall, above ceiling, and final site observations.

3.02 PROTECTION OF ROTATING PARTS

A. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.

B. Provide exposed couplings with coupling guards.

C. Equip propeller fans with guards.

D. Equip inlets and outlets of open centrifugal fans with 1 1/2" #10 Diamond mesh galvanized steel screens.

E. All motors or other equipment exposed to weather shall be provided with weatherproof covers.

3.03 PROTECTION OF EQUIPMENT

A. During construction, protect mechanical equipment from damage or deterioration.

B. When installation is complete, clean equipment and make ready for painting.

C. During construction all ductwork, piping, and equipment shall be stored in a clean/dry location. Any ductwork or piping stored outside that is not protected shall be removed from the job site.

D. Installed ductwork and piping shall have open ends covered at the end of each work day to prevent dust, dirt, and water from entering the ductwork and piping.

E. Seal all joints and seams of ductwork as it is installed.

3.04 INSTALLATION OF EQUIPMENT

A. Install equipment to provide normal service access to all components.

B. Provide sufficient space for removing components, install equipment to provide such clearance.

C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.

D. All equipment shall be firmly fastened in place:
   1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.
   2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
   3. Vibration isolators shall be secured to floors, pads or structure and equipment shall be bolted to the isolators.

3.05 EQUIPMENT SUPPORTS

A. Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors.

B. Set all floor-mounted equipment, other than condensate pumps, on concrete pads or rails (as indicated of height shown, but not less than 4" high). Coordinate pad height with condensate drain trap requirements. Chamfer rails and pads 1". Where shown, provide reinforced floating pads mounted on vibration isolators. Form, reinforce and pour any pads and rails required but not shown on Structural and Architectural Drawings.

3.06 CUTTING AND PATCHING

A. Set sleeves and inserts and lay-out and form openings in walls, beams, girders and structural floors in this Section.

B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

3.07 INCIDENTAL WORK

A. Do all control wiring required for Mechanical work.

B. Final water connections to services are included in this Section.

C. Permanent drain connections for AC units, etc., and auto air vents to nearest floor drain are included in this Section.

D. (Healthcare Only) Outside air intakes shall be a minimum of 6'-0" above grade or 3'-0" above the roof.

E. Door louvers are not included in this Section.

F. Items obviously omitted from drawings and/or specifications shall be called to attention of the Architect / Engineer prior to submitting Bid, after award of Contract any changes or rearrangements necessary to complete Contract shall be at no additional cost to Owner.

3.08 DEMOLITION

A. Certain existing HVAC equipment to be removed and/or relocated as shown or noted. Equipment removed will remain the property of the Owner unless designated otherwise. Remove from the premises all items not retained by the Owner.

3.09 CONNECTIONS TO EXISTING SYSTEMS

A. Make connections to existing systems only at time authorized, in writing, by Owner.

B. Do not take heating or cooling system out of service during occupied working, office or school hours.

C. Drain existing systems and flush, fill, vent, test, balance and put existing systems into operation after connections have been made.

D. Repair existing insulation at points of connection to existing work. Insulation style and thickness at connections to existing ductwork shall match existing.

E. Mechanical contractor is required to replenish any chemicals after flushing and filling of closed or open loop piping systems.

3.10 PAINTING

A. Refinish equipment damaged during construction to new condition. Painting shall be provided by General Contractor.

B. Paint un-insulated duct surfaces visible through grilles and registers flat black.

C. Other painting is specified in "PAINTING SECTION, Finishes Division".

3.11 ACCESS DOORS

A. Provide access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-lift-out ceilings or behind partitions or walls.

3.12 USE OF HVAC SYSTEM DURING CONSTRUCTION

A. Ducted HVAC systems may be used during construction as long as the following conditions are met:

1. The construction site shall be kept clean and swept, wet mopped, or vacuumed on a regular basis to reduce the amount of airborne dust.
2. All AC units shall have filters installed in the AC units that are equal to the filters that are scheduled for each piece of equipment. The Mechanical contractor shall be responsible for changing the filters in all AC units during construction at a minimum of every 30 days starting from the day the AC units are started. At the completion of the project, the Mechanical contractor shall replace all filters.
3. All return air and outside air openings shall be protected with temporary filter media. The temporary filter media shall be changed by the Mechanical contractor. Temporary filter media is required to protect the installed ductwork. During or after construction, if any ductwork is observed without temporary filter media, the Mechanical contractor shall be solely responsible for cleaning the entire ductwork system and AC unit. Temporary filter media shall be changed bi-weekly at a minimum.
4. All AC units shall have all correct motor overload elements installed and all safeties shall be wired and operational prior to temporary use of the AC unit.
5. Temporary controls and temporary control sequences may be utilized by the contractor until the permanent controls and control sequences are installed. Temporary control methods shall be the sole responsibility of the contractor.
6. All AC units required to have factory start-up shall have factory start-up completed prior to use.
7. The building envelope for the area served by the AC units shall be substantially complete prior to using the AC units during construction. Temporary walls and doors shall be constructed by the General Contractor as needed.
8. Water treatment chemicals shall be provided by the Mechanical Contractor for all open and closed piping systems during construction. The Mechanical Contractor is responsible for maintaining proper chemical treatment during construction.
9. Correct levels of antifreeze shall be installed in all systems for which antifreeze is shown, scheduled or specified. The Mechanical Contractor is responsible for maintaining proper antifreeze levels during construction.

B. Ductless split systems shall NOT be used during construction. Protect all indoor sections of ductless split systems during construction to prevent dust, dirt, or water from entering the unit.

C. The Mechanical Contractor shall turn the system over to the Owner in condition which is equal to what would have occurred if they system had not been used during construction.

D. The Mechanical Contractor shall be responsible for any costs associated with cleaning the equipment or ductwork to return it to a like new condition prior to turning the system over to the Owner.

3.13 TEMPORARY HVAC

A. If the HVAC system can not be used during construction for whatever reason, the Mechanical Contractor shall be responsible for providing temporary heating / cooling. Temporary HVAC system shall be sized based on whatever conditions the General Contractor needs in order to execute his work, or shall be sized comparable to the capacities shown on the construction documents.

B. The mechanical contractor shall be responsible for coordinating all temporary power requirements and shall coordinate all temporary HVAC equipment locations and ductwork routing thru the building.

3.14 WARRANTY AND INSTRUCTIONS

A. See General Conditions - One-Year Warranty.

B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one (1) year after date of substantial completion of the Contract. Should any defects in materials, workmanship, or equipment be made known to Contractor within the one (1) year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.

C. All centrifugal, reciprocating, screw or scroll type refrigeration compressors shall bear five (5) year non-pro-rated parts warranty.

D. All gas fired air furnaces shall bear ten (10) year prorated heat exchanger warranties.

E. After completion of the work, Contractor shall operate the equipment which he installs for a period of ten (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment. Furnish necessary oral and written operating instructions to the Owner's representative.

F. Provide five (5) sets of manufacturer's operating and maintenance manuals and parts lists including nearest manufacturer's sales and service representative by name, address and phone for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency. Include all warranty dates on equipment and guarantees. Include names, address and phone of any subcontractor and work performed. Provide O&M manuals.

G. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.

H. Supply initial charges of refrigerant, refrigeration lubricating oil; and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.

I. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.
   1. Service shall include:
      a. On call nuisance issues.
      b. Replenishing refrigerant and antifreeze if loss occurs due to system failure.
   2. Service shall not include:
      a. Routine maintenance of the equipment unless specified in specific equipment specification section(s).

3.15 TRAINING OF OWNER PERSONNEL

A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. Training shall be conducted twice during the 1-year warranty period. Training shall be scheduled during a warmer time of the year to demonstrate proper cooling operation of the HVAC system. Training shall also be scheduled during a cooler time of the year to demonstrate proper heating operation of the HVAC system.

C. The Engineer shall be responsible for approving the content and adequacy of the training of Owner personnel.
   1. Each Sub and vendor responsible for training shall submit a written training plan to the Mechanical Engineer for review and approval prior to training. The plan will cover the following elements:
      a. Equipment (include in training).
      b. Intended audience.
      c. Location of training.
      d. Objectives.
      e. Subjects covered (description, duration of discussion, special methods, etc.).

f. Duration of training on each subject.
g. Instructor for each subject.
h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.).
i. Instructor and qualifications.

2. For the primary HVAC equipment, the Controls Contractor shall discuss the control of the equipment during the mechanical training conducted by the manufacturer's representative.
3. The General Contractor shall develop an overall training plan and shall coordinate and schedule with the Subcontractors. The Engineer will recommend approval of the training to the Owner upon satisfactory completion using a standard approval form. The Owner and the Contractors shall sign the approval form.
4. Video recording of the training sessions shall be provided by the General Contractor and shall be given to the Owner.

D. Mechanical Contractor. The Mechanical Contractor shall have the following training responsibilities:
1. Provide the Mechanical Engineer and Owner with a training plan during the submittal process.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, boilers, furnaces, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.
3. Training shall normally start with classroom sessions followed by hands-on-training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The Controls Contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operations and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:
a. Use of the installation, operation and maintenance instruction material included in the O&M manuals.
b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
c. Discussion of relevant health and safety issues and concerns.
d. Discussion of warranties and guarantees.
e. Common troubleshooting problems and solutions.
f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
g. Discussion of any peculiarities of equipment installation or operation.
9. Hands-on training shall include start-up, operation in all modes possible, including manual, start-up, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

10. The Mechanical Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
11. Training shall occur after functional testing is complete, unless approved otherwise by the Owner.
12. Minimum Duration of Training. The Mechanical Contractor shall provide training on each piece of equipment according to the following schedule:

Hours	System
4	Split System AC or Heat Pumps
1	Fans
4	Stand Alone HVAC Controls

3.16 PROJECT CLOSE-OUT DOCUMENTS

A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following in PDF format:
   1. Record drawings - sheet metal work.
   2. Air balance report.
   3. Equipment Submittal Data.
   4. Equipment operating and maintenance manuals.
   5. Maintenance schedule.
   6. Equipment warranty dates and guarantees.
   7. List of Owner's Personnel who have received maintenance instructions.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Balancing Air Systems:
   1. Constant-volume air systems.

B. Testing, adjusting, and balancing existing systems and equipment.

C. Measurement of final operating condition of HVAC systems.

1.02 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.03 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, current edition.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods, current edition.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems, current edition.

D. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems, current edition.

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing, current edition.

1.04 SUBMITTALS

A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Provide reports in PDF format. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   4. Units of Measure: Report data in I-P (inch-pound) units only.
   5. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Engineer.
      g. Project Contractor.
      h. Project altitude.
      i. Report date.

1.05 FIELD CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   4. SMACNA (TAB).
   5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

F. TAB Supervisor Qualifications: Professional Engineer licensed in the State in which the Project is located.

3.02 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.
   1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. The Mechanical Contractor and Factory Representative of the Boilers, Chillers, AC units and major HVAC equipment has placed every item of such equipment into satisfactory operation with all automatic and safety devices operable.
   2. Systems are started and operating in a safe and normal condition.
   3. Temperature control systems are installed complete and operable.
   4. Proper thermal overload protection is in place for electrical equipment.
   5. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   6. Duct systems are clean of debris.
   7. Fans are rotating correctly.
   8. Fire and volume dampers are in place and open.
   9. Air coil fins are cleaned and combed.
   10. Access doors are closed and duct end caps are in place.
   11. Air outlets are installed and connected.
   12. Duct system leakage is minimized.
   13. Hydronic systems are flushed, filled, and vented.
   14. Pumps are rotating correctly.
   15. Proper strainer baskets are clean and in place.
   16. Service and balance valves are open.

Q. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

R. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Prepare a TAB plan that includes the following:

   1. Equipment and systems to be tested.
   2. Strategies and step-by-step procedures for balancing the systems.
   3. Instrumentation to be used.
   4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Airside:
      a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
      b. Duct systems are complete with terminals installed.
      c. Volume, smoke, and fire dampers are open and functional.
      d. Clean filters are installed.
      e. Fans are operating, free of vibration, and rotating in correct direction.
      f. Variable-frequency controllers' startup is complete and safeties are verified.
      g. Automatic temperature-control systems are operational.
      h. Ceilings are installed.
      i. Windows and doors are installed.
      j. Suitable access to balancing devices and equipment is provided.

C. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

D. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the Engineer to facilitate spot checks during testing.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. The Mechanical Contractor shall submit equipment manufacturers' start up reports for all major HVAC equipment.

H. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

I. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 GENERAL PROCEDURE FOR BALANCING AIR SYSTEMS

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross-sectional area of duct.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Measure air quantities at air inlets and outlets.

E. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

F. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

G. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

H. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

I. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

J. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

K. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

L. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

M. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

N. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

O. On fan powered VAV boxes, adjust air flow switches for proper operation.

P. For variable-air-volume systems, develop a plan to simulate diversity.

Q. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

R. Verify that motor starters are equipped with properly sized thermal protection.

S. Check dampers for proper position to achieve desired airflow path.

T. Check for airflow blockages.

U. Check condensate drains for proper connections and functioning.

V. Check for proper sealing of air-handling-unit components.

3.07 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.

c. Measure static pressure across each component that makes up the air-handling system.
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from **Architect** for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.08 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.09 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.

3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.

n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

G. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm.
i. Face area in sq. ft.
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Airflow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

END OF SECTION

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT - SECTION 15061

PART 1 GENERAL

1.01 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify the Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
   1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.

B. Installer's Qualifications: Include evidence of compliance with specified requirements.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.03 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

D. Installer Qualifications for Field-Welding: As specified in Section 055000.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with MSS SP-58.
   2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be

supported with a minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123 or ASTM A153.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
    1. Manufacturers:
        a. Cooper B-Line, a division of Eaton Corporation
        b. Ferguson Enterprises Inc.
        c. Thomas & Betts Corporation.
        d. Unistrut.
        e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
    2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
    3. Comply with MFMA-4.
    4. Channel Material:
        a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
        b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
    5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
    6. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
    1. Minimum Size, Unless Otherwise Indicated or Required:
        a. Equipment Supports: 1/2 inch diameter.
        b. Piping up to 1 inch nominal: 1/4 inch diameter.
        c. Piping larger than 1 inch nominal: 3/8 inch diameter.
        d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Steel Cable:
    1. Manufacturers:
        a. Ductmate Industries, Inc.
        b. Source Limitations: Furnish associated fittings, accessories, and hardware produced by a single manufacturer.

E. Thermal Insulated Pipe Supports:
    1. General Construction and Requirements:
        a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
        b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
        c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
        d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
    2. PVC Jacket:
        a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
        b. Minimum Service Temperature: Minus 40 degrees F.
        c. Maximum Service Temperature: 180 degrees F.

d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96.
e. Thickness: 60 mil.
f. Connections: Brush on welding adhesive.

3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

F. Pipe Supports:
1. Liquid Temperatures Up To 122 degrees F:
a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
b. Support From Below: MSS SP-58 Types 35 through 38.
2. Operating Temperatures from 122 to 446 degrees F:
a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.
b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.
c. Sliding Support: MSS SP-58 Types 35 through 38.

G. Pipe Stanchions: For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
1. Manufacturers:
a. Anvil International
2. Material: Malleable iron, ASTM A47; or carbon steel, ASTM A36.
3. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.

H. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
1. Manufacturers:
a. Ferguson Enterprises Inc.
2. Material: ASTM A36 carbon steel or ASTM A181 forged steel.
3. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

I. Riser Clamps:
1. Manufacturers:
a. Ferguson Enterprises Inc.
2. Provide copper plated clamps for copper tubing support.
3. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

J. Strut Clamps: Two-piece pipe clamp.

K. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.

L. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
1. Material: Malleable iron, ASTM A47; or carbon steel, ASTM A36.
2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

M. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
1. Manufacturers:
a. Anvil International
2. Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
3. Pipe Diameter 8 inches: Provide U-bolts with double nuts providing minimum clearance of 0.28 inch.
4. Pipe Diameter 8 inches: 0.625 inch U-bolt.
5. Pipe Diameter 10 inches: 0.75 inch U-bolt.
6. Pipe Diameter 12 to 16 inches: 0.875 inch U-bolt.
7. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.

N. Pipe Alignment Guides: Galvanized steel.
1. Manufacturers:

a. Anvil International
2. Pipe Diameter 8 inches and Smaller: Spider or sleeve type.
3. Pipe Diameter 10 inches and Larger: Roller type.
4. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.

O. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

P. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Manufacturers:
a. Anvil International; H-Block
b. Cooper B-Line
c. Ferguson Enterprises Inc
d. Unistrut
2. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
5. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

Q. Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
b. Shields Material: UV-resistant polypropylene with glass fill.
c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
d. Minimum Service Temperature: Minus 40 degrees F.
e. Maximum Service Temperature: 178 degrees F.
f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

R. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Comply with MFMA-4.
b. Channel Material: Use galvanized steel.
c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
10. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by the Engineer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by the Engineer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT - SECTION 15066

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

B. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

D. Operation Data: Include instructions for safe operating procedures.

E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.02 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for HVAC use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Conform to NFPA 70.

C. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.04 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide 3 year manufacturer warranty for all motors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Baldor Electric Company/ABB Group

B. Leeson Electric Corporation

C. Regal-Beloit Corporation (Century)

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.

B. Electrical Service:
   1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
   2. Motors Larger than 1/2 Horsepower: As scheduled volts, three phase, 60 Hz.

C. Nominal Efficiency:
   1. Open Motor with Two Poles: 82.5.
   2. Open Motor with Four Poles: 82.5.
   3. Open Motor with Six Poles: 50.0.
   4. Enclosed Motor with Two Poles: 75.5.
   5. Enclosed Motor with Four Poles: 82.5.
   6. Enclosed Motor with Six Poles: 50.0.

D. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.

3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
4. Motors with frame sizes 254T and larger: Energy efficient type.

E. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

F. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

G. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

H. Motors:
1. 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower three phase motors shall be of premium energy-efficient design with apparent efficiency (power factor X efficiency) not less than ASHRAE 90.1.
2. All motors served by variable frequency drives (VFD's) shall be inverter duty rated.
3. Unless shown otherwise motors less than 1/2 HP shall be single phase, motors 1/2 HP and larger shall be three phase.

2.03 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.

B. Single phase motors for shaft mounted fans and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

F. Motors located in exterior locations, air cooled condensers, and direct drive axial fans: Totally enclosed type.

G. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

H. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

2.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Nominal Efficiency: Premium when tested in accordance with IEEE 112.

2.05 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Nominal Efficiency: Premium when tested in accordance with IEEE 112.

2.06 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Nominal Efficiency: Premium when tested in accordance with IEEE 112.

2.07 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 262913.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed Motors: Epoxy coat windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: Premium when tested in accordance with IEEE 112.

N. Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

2.08 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Manufacturers:
   1. US Motors, a brand of NIDEC Motor Corporation;
   2. Substitutions: See Section 016000 - Product Requirements.

B. Applications:
   1. Commercial:
      a. Roof Top Unit:
         1) Operating Mode: Constant speed.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the roof top unit and/or specified sequence of operation.
         3) Shaft Extension: Single.
         4) RPM: 300 through 1200.
      b. DX Fan Coil Unit:
         1) Operating Mode: Constant cfm.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the DX fan coil unit and/or specified sequence of operation.
         3) Shaft Extension: Single.
         4) Options: Remote mount control/User-Interface.

5) RPM: 300 through 1250.

c. Power Roof Ventilator:
   1) Operating Mode: Constant cfm.
   2) Input: Motor manufacturer to coordinate control requirements with the control board of the PRV and/or specified sequence of operation.
   3) Shaft Extension: Single.
   4) Options: Remote mount control.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. All motors or other equipment exposed to weather shall be provided with weatherproof covers.

D. Provide all motors incidental to the Mechanical Systems. Wiring of motors, switches and starters is included in "ELECTRICAL SECTIONS".

E. Check line voltage and phase and ensure agreement with nameplate.

F. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.

G. Should the Contractor with the Architect's/Engineer's approval make changes in electrical equipment from those shown on the Electrical Drawings, he shall be responsible for the coordination and cost of required changes.

H. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

I. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.

J. Provide thermal overload with equipment for motors 1/2 HP and less at 120/1/60.

END OF SECTION

PART 1 GENERAL

1.01 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g. ductwork, piping).

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Notify the Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured.

1.03 SUBMITTALS

A. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification method for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Product Data:
   1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
   2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Perform design and installation in accordance with applicable codes.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
   4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
   5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2 inch operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation: As indicated on drawings.

2.02 MANUFACTURERS

A. Kinetics Noise Control, Inc

B. Mason Industries

C. Vibration Eliminator Company, Inc

2.03 PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
   2. Steel springs to function without undue stress or overloading.
   3. Steel springs to operate in the linear portion of the load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
   4. Lateral to vertical stiffness ratio to not exceed 0.08 with spring deflection at minimum 75 percent of specified deflection.
   5. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches between the base and floor or support beneath unless noted otherwise.

2.04 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.
   3. Seismic Snubbing Elements for Seismic Isolators:
      a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
      b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

B. Vibration Isolators for Non-Seismic Applications:
   1. Resilient Material Isolator Pads:

a. Description: Single or multiple layer pads utilizing elastomeric (e.g. neoprene, rubber) or fiberglass isolator material.
b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.

2. Resilient Material Isolator Mounts, Non-Seismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g. neoprene, rubber) or fiberglass isolator material; fail-safe type.
3. Housed Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
   b. Furnished with integral elastomeric snubbing elements, non-adjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
   c. Bottom Load Plate: Steel with non-skid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   d. Furnished with integral leveling device for positioning and securing supported equipment.

C. Non-Seismic Type:
1. All Elastomeric-Fiber Glass Pads:
   a. Configuration: Flat or molded.
   b. Thickness: 0.25 inch minimum.
   c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
2. Ribbed Elastomeric Pads:
   a. Configuration: Flat/Ribbed.
   b. Thickness: 0.25 inch minimum.
   c. Assembly: Single or double ribbed, galvanized sheet metal separation when 2 sheets bonded together, oil resistant compound with no color additives.
3. Elastomeric Mounts:
   a. Material: Oil, ozone, and oxidant resistant compounds.
   b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
4. Steel Springs:
   a. Assembly: Freestanding, laterally stable without housing, steel base plates, ribbed elastomeric pads.
   b. Leveling Device: Leveling bolts, rigidly connected to equipment or frame.
5. Restrained Steel Springs:
   a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
   b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
6. Elastomeric Hangers:
   a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
   b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.
7. Spring Hanger:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
8. Combination Elastomeric-Spring Hanger:
   a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

9. Thrust Restraints:
    a. Housing: Steel construction containing stable steel spring and integral elastomeric element installed in pairs to resist air pressure thrusts.
    b. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Field-Welding (where approved by the Engineer): Comply with Section 055000.

E. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
    1. Vibration-Isolated Equipment Support Bases:
        a. Provide specified minimum clearance beneath base.
    2. Spring Isolators:
        a. Position equipment at operating height; provide temporary blocking as required.
        b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
        c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
    3. Isolator Hangers:
        a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
        b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
    4. Thrust Restraints:
        a. Adjust restraint movement under normal operating static pressure.
    5. Clean debris from beneath vibration-isolated equipment that could cause short circuiting of isolation.
    6. Use elastomeric grommets for attachments where required to prevent short circuiting of isolation.
    7. Adjust isolators to be free of isolation short circuits during normal operation.
    8. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

END OF SECTION

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT - SECTION 15076

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Pipe markers.

C. Ceiling labels.

D. Thermostat labels.

1.02 SUBMITTALS

A. Product Data: Provide manufacturers catalog literature for each product required.

B. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Automatic Controls: Tags.

C. Heat Transfer Equipment: Nameplates.

D. Instrumentation: Tags.

E. Small-sized Equipment: Tags.

F. Thermostats: Nameplates.

G. Fans: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:
   1. Advanced Graphic Engraving, LLC
   2. Brimar Industries, Inc.
   3. Kolbi Pipe Marker Co.
   4. Seton Identification Products, a Tricor Direct Company
   5. Substitutions: See Section 016000 - Product Requirements.

B. Letter Color: Black for normal power and Red for emergency power.

C. Letter Height: 1/4 inch.

D. Background Color: White.

E. Plastic: Conform to ASTM D709.

2.03 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation
   2. Brimar Industries, Inc.
   3. Kolbi Pipe Marker Co.
   4. MIFAB, Inc.
   5. Seton Identification Products, a Tricor Company

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping. Letter size shall be at least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

2.04 CEILING LABELS

A. Provide labels generated from a label maker and fully adhered to ceiling grid or access doors wherever equipment is required to be accessed.

B. Labels shall identify equipment based on construction documents nomenclature and shall coordinate with the building automation system nomenclature for equipment.

C. Color code as follows:
1. HVAC Equipment: Black text on a White label.

2.05 THERMOSTAT LABELS

A. Provide labels generated from a label maker and fully adhered to the face of the thermostat. Thermostat labels shall be white labels with black text and shall correspond to the equipment ID located on the construction documents and building automation system. Coordinate with owner for any special label requirements for the building.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. In existing building replace all existing nameplates which do not comply with above colors.

B. Install plastic pipe markers in accordance with manufacturer's instructions. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
1. Label Spacing and Extent:
   a. On straight run of pipes; Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
   b. Wherever a pipe enters or leaves a room or building.
   c. At change of direction.
   d. At main valves and control valves (not equipment valves).
   e. On risers, just above and below floors.

C. Pipe Label Color Schedule:
1. Coordinate label color scheme with building owner.
2. Condensate Drain Piping: White letters on a safety-green background
3. Refrigerant Piping: Black letters on a safety-orange background

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions. Tape labels shall fully encircle piping so piping label is fully adhered to itself.

E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.05 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in "Hangers and Supports for HVAC Piping and Equipment" specification section.

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.06 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Building shall be at a state of construction to prevent rain water from coming in contact with insulation that is installed on ductwork or stored on site.

C. Maintain temperature during and after installation for minimum period of 24 hours.

1.08 DEFINITIONS

A. Exposed: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".

B. Attic: Any space that is between an insulated ceiling and a non-insulated roof.

C. Exterior: Any space that is external to the conditioned building envelope.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 CLOSED-CELL FOAM PIPE COVERING

A. Manufacturer:
   1. Aeroflex USA, Inc.
   2. Armacell LLC; AP Armaflex
   3. K-Flex USA LLC; K-Flex Titan

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 1; use molded tubular material wherever possible.
   1. 'K' Value:
      a. 0.245 Btu*in/(hr*ft²*°F) at 75°F, 3/8" through 1" thickness.
      b. 0.28 Btu*in/(hr*ft²*°F) at 75°F, 1-1/2" through 2" thickness.
   2. Minimum Service Temperature: Minus 297°F.
   3. Maximum Service Temperature: 220°F.
   4. Water Absorption: 0.2% by volume.
   5. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

D. Pipe covering may be seamless insulation slipped over piping before fabrication or may be slit longitudinally and installed over fabricated piping.

E. Make fitting covers from segments of pipe covering.

F. Cement all joints and seams in accordance with manufacturer's recommendations.

2.03 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96.
      d. Thickness: 10 mil.
      e. Connections: Pressure sensitive color matching vinyl tape.
   2. Covering Adhesive Mastic: Compatible with insulation.

B. ABS Plastic:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: Minus 40 degrees F.
      b. Maximum Service Temperature: 180 degrees F.
      c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96.
      d. Thickness: 30 mil.
      e. Connections: Brush on welding adhesive.

C. Aluminum Jacket: ASTM B209 formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Stucco embossed.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested and are free of defects before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.03 INSTALLATION

A. Repair existing insulation at points of connection to existing work.

B. Install in accordance with manufacturer's instructions.

C. Install in accordance with NAIMA National Insulation Standards.

D. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

E. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

F. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

G. Install insulation with longitudinal seams at top and bottom of horizontal runs.

H. Install multiple layers of insulation with longitudinal and end seams staggered.

I. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

J. Keep insulation materials dry during application and finishing.

K. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

L. Install insulation with least number of joints practical.

M. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

Q. Exposed Piping: Locate insulation and cover seams in least visible locations.

R. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

S. For hot piping conveying fluids 140°F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

T. For hot piping conveying fluids over 140°F, insulate flanges and unions at equipment.

U. Inserts and Shields:
   1. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   2. Insert location: Between support shield and piping and under the finish jacket.
   3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   4. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

V. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

W. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with aluminum jacket.

X. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.04 INSULATION WETTED DURING CONSTRUCTION:

A. Contractor shall replace any and all insulation wetted during construction at his own expense.

3.05 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. Extend jacket of outdoor insulation outside roof flashing at least 6 inches below top of roof flashing.
   3. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
   3. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.06 SCHEDULE

A. Refrigerant Suction Lines and Liquid Lines: "Flexible Elastomeric", 1" thick. Jacket outdoor piping with aluminum jacket.

B. AC Unit Drain Lines: "Flexible Elastomeric", 3/4" thick. Jacket outdoor piping with aluminum jacket.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.02 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience.

C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.05 SCHEDULING

A. Schedule insulation application after pressure testing ductwork systems that are specified to be pressure tested. Insulation application may begin on segments that have satisfactory test results.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Building shall be at a state of construction to prevent rain water from coming in contact with insulation that is installed on ductwork or stored on site.

C. Maintain temperature during and after installation for minimum period of 24 hours.

1.07 DEFINITIONS

A. Exposed: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".

B. Attic: Any space that is between an insulated ceiling and a non-insulated roof.

C. Exterior: Any space that is external to the conditioned building envelope.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with NFPA 90A.

B. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE WRAP

A. Manufacturer:
   1. Johns Manville
   2. Knauf Insulation
   3. Owens Corning Corporation
   4. CertainTeed Corporation

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.29 Btu*in/(hr*ft²*°F) at 75°F.
   2. Installed 'R' value: 2.2" thick (R-6.0), 3" thick (R-8.3).
   3. Maximum Service Temperature: 250°F.
   4. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.03 GLASS FIBER, RIGID BOARD

A. Manufacturer:
   1. Johns Manville
   2. Knauf Insulation
   3. Owens Corning Corporation
   4. CertainTeed Corporation

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' Value: 0.23 Btu*in/(hr*ft²*°F) at 75°F.
   2. Installed 'R' value: 1.5" thick (R-6.5), 2" thick (R-8.7).
   3. Maximum Service Temperature: 450°F.
   4. Maximum Water Vapor Absorption: 5.0 percent.
   5. Maximum Density: 6 lb/cu ft.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch when tested in accordance with ASTM E96.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.04 JACKETS

A. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Indoor: Smooth. Outdoor: Stucco Embossed.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.05 DUCT LINER

A. Manufacturers:
   1. Johns Manville
   2. Knauf Insulation
   3. Owens Corning Corporation
   4. CertainTeed Corporation

B. Non-corrosive, incombustible glass fiber complying with ASTM C1071; rigid board, and preformed round liner board; impregnated surface and edges coated with acrylic polymer.
   1. Fungal Resistance: No growth when tested according to ASTM G21.
   2. Conductance: 1" Thick, maximum of 0.24 Btu*in/(hr*ft^2*°F) at 75°F.
   3. Service Temperature: Up to 250°F.
   4. Rated Velocity on Coated Air Side for Air Erosion: 6,000 fpm, minimum.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, self-adhesive pad or impact applied with integral or press-on head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulate all items subject to sweating or loss of heat.

D. Repair existing insulation at points of connection to existing work.

E. Insulated ducts conveying air below & above ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, registers, diffusers, fire dampers, flexible connections, and expansion joints.

F. Exterior Applications: "Glass Fiber, Rigid Board". Provide insulation board with vapor barrier jacket. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic. Cover with calked aluminum jacket with seams located on bottom side of horizontal duct section. Slope top of rigid board & jacket so that rain will not stand on top side of duct.

G. "Glass Fiber, Flexible Wrap" Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive/mastic.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
   6. On rectangular and flat oval ducts 30" wide and wider, additionally support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.

H. "Duct Liner" Application:
   1. Apply in accordance with SMACNA "Duct Liner Application Standard" over full coverage adhesive. Coat all edges with adhesive and seal all punctures or tears with mastic before installing ducts. Cut liner to assure overlapped and compressed longitudinal corner joints. Fasteners shall be sized appropriately for thickness of liner utilized. Provide mechanical fasteners and metal nosings as noted below:

      a. For all velocities, provide metal nosings on upstream edge of liner at connections to equipment: Fans, coils, dampers, AC Units, sound absorbers, etc.

b. For velocities up to 2,000 feet per minute: Start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 12"o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere locate fasteners a maximum of 18" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break.

c. For velocities from 2,001 to 4,000 feet per minute: Start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 6" o.c. around the perimeter of the duct, except that they may be a maximum of 6" from a corner break. Elsewhere locate fasteners a maximum of 16" o.c., except that they shall be placed not more than 6" from a longitudinal joints of the liner nor more than 12" from a corner break. In addition to the adhesive edge coating of transverse joints, coat and longitudinal joints with adhesive.

d. For velocities from 4,001 to 6,000 feet per minute: Same as 2 above except that metal nosing shall be installed to secure liner at all upstream transverse edges.

I. **Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.**

3.03 INSULATION WETTED DURING CONSTRUCTION:

A. Contractor shall replace any and all insulation wetted during construction at his own expense.

3.04 SCHEDULES

A. Air Terminal Devices:
   1. Ceiling Mounted Supply Diffusers: 2.2" thick "Glass Fiber, Flexible Wrap". Seal edges to diffuser, do not tape insulation to ceiling grid.
   2. Fire Dampers for internally lined ductwork: 2.2" thick "Glass Fiber, Flexible Wrap". Seal edges to the wall. Do not penetrate wall, floor, or partition with insulation.

B. Low Pressure Ductwork:
   1. Rectangular Supply Duct: 2.2" thick "Glass Fiber, Flexible Wrap".
   2. Rectangular Return & Relief Duct: 2.2" thick "Glass Fiber, Flexible Wrap".
   3. Rectangular Exhaust Duct, first 25 feet from Exhaust Fan: 1" thick "Duct Liner".
   4. Rectangular Outside Air Duct: 2.2" thick "Glass Fiber, Flexible Wrap".
   5. Mixed air plenums in mechanical rooms: 2" thick "Glass Fiber, Rigid Board",
   6. All round ductwork: 2.2" thick "Glass Fiber, Flexible Wrap".

C. Ductwork located Outdoors:
   1. Ducts located outdoors: 2" thick "Glass Fiber, Rigid Board", seal all joints & seams with mastic, provide aluminum jacket around entire duct & slope insulation on top side of duct to shed water. Slope insulation and jacket away from building.

D. Manufactured Oval and Round ductwork:
   1. Flat Oval and Round Medium Pressure Supply Duct: Double wall per section 23 3100, "HVAC Ducts and Casings".
   2. Flat Oval and Round Medium Pressure Supply Duct in Attic: Double wall per 23 3100, "HVAC Ducts and Casings", plus 3" thick wrap.

E. Miscellaneous:
   1. Conical and straight spin ins on both lined and unlined ducts shall be insulated with 2.2" thick "Glass Fiber, Flexible Wrap". Insulation shall be slit at damper rods, at spin ins and sealed vapor tight.
   2. Ducts located in mechanical rooms up to 10'-0" a.f.f.: 2" thick "Glass Fiber, Rigid Board", seal all joints & seams with mastic.

END OF SECTION

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING - SECTION 15116

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Manufactured sleeve-seal systems.

1.02 SUBMITTALS

A. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.
   2. Approved by manufacturer.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Manufacturers:
   1. Flexicraft Industries
   2. Substitutions: See Section 016000 - Product Requirements.

B. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

D. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

E. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

F. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

G. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Engineer.

H. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Manufacturers:
   1. Advance Products & Systems, LLC.
   2. Flexicraft Industries; PipeSeal
   3. Substitutions: See Section 016000 - Product Requirements.

B. Modular/Mechanical Seal:
   1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
   2. Provide watertight seal between pipe and wall/casing opening.
   3. Elastomer element size and material in accordance with manufacturer's recommendations.
   4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber in compliance with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment drains.

B. Pipe hangers and supports.

1.02 SUBMITTALS

A. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturers catalogue information.
   3. Joining materials.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications:
   1. Company specializing in performing work of the type specified in this section, with minimum three years of experience.
   2. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

C. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

D. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

E. Coupling Manufacturer:
   1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
   2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
   3. A distributor's representative is not considered qualified to perform the training.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Contractor's option, PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

C. ABS Pipe: ASTM D2680.
   1. Fittings: Compatible with piping material.
   2. Joints: Solvent welded with ASTM D2235 cement.

2.02 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel, adjustable adjustable, clevis.
   3. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
   5. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.
   6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.
   8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   9. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.
   10. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
   11. Vertical Support: Steel riser clamp.
   12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   14. Floor Support for Hot Pipe Sizes 6 Inches and Greater: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
   15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   16. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   17. Inserts: Threaded Rod Hangers or Drop-In anchors, malleable iron case ofgalvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems.

3.02 PIPE JOINT CONSTRUCTION:

   1. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
   2. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
   3. 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. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

b. 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.

4. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
5. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
6. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. 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. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   c. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
   d. PVC Nonpressure Piping: Join according to ASTM D 2855.
7. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.
8. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
9. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.
10. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

3.03 INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Shop 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 in accordance with manufacturer's instructions.

E. Install heating water, glycol, chilled water, condenser water, non-potable, and boiler blowdown piping to ASME B31.9 requirements. After installation test all systems per ASME B31.9 at 1.5 times the system pressure.

F. Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9 requirements.

G. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

H. Install piping to conserve building space and to avoid interfere with use of space. Route piping as high as practical and not on floors unless otherwise indicated. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal. Install piping to allow application of insulation. Install piping free of sags and bends.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing valves.

K. No mitering or notching for fittings permitted. Weldolets permitted where branch size is two pipe sizes smaller than main. 45 degree saddles permitted where shown. Use long radius ells unless otherwise noted.

L. Provide drain traps for AC Unit drain pans. Size traps as required to drain under operating conditions. Provide drain on low side of drain traps for draining of traps during winter months.

M. Group piping whenever practical at common elevations.

N. Sleeve pipe passing through partitions, walls and floors. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place. Extend sleeves 1-1/2" above finish floor and waterproof.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.
   1. For uninsulated pipe through fire rated walls or partitions or floors outside chases: Pipe Shields, Inc., Model WFB or approved equal at walls, Model DFB at floors.
   2. For insulated pipe passing through fire rated partitions or walls or floors outside chases: Pipe Shields, Inc., Model WFB-CS for hot lines, VFB-CS-CW for cold lines. Insulation: Calcium silicate for hot lines and foamglass for cold lines, thickness specified for adjacent pipe covering.
   3. At Contractor's option, instead of the factory fabricated sleeves specified above for pipe passing through floors and fire rated walls and partitions substitute 20 gauge galvanized steel sleeve 1/2" larger in diameter than pipe or pipe covering and seal both ends of sleeve with 3M Branch Fire Barrier Caulk CP25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1". Where pipe is insulated, insulation shall be continuous thru sleeve, calcium silicate for hot lines and foamglass for cold lines. In exposed areas, after product has dried it shall be sanded smooth for painting under painting section.

P. Slope piping and arrange to drain at low points.

Q. Make threaded joints with teflon tape.

R. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.

S. Install 3/4" ball or gate valve drains with hose adapters at low points of water piping and at bases of all risers or where shown.

T. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2 1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide rubber grommets at pipe penetrations to equipment casings.

U. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulation unions or couplings, equal to EPCO.

V. Provide reduced pressure principal backflow preventers as indicated on plans or verify that plumbing contractor is providing. Make final connections to equipment/piping under HVAC work. Note that all piping and insulation downstream of backflow preventer must be painted yellow.

W. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Support all underground piping solidly along body of pipe.

X. Pipe shall be braced at flexible connections to prevent blowouts under operating conditions.

Y. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two (2) wrappings of polyvinyl chloride tape.

Z. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

AA. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
   1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.
   2. Use flexible couplings in expansion loops.

BB. Grooved Joints:
   1. Install in accordance with the manufacturer's latest published installation instructions.

2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

CC. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

DD. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

EE. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

FF. Provide access where valves and fittings are not exposed.

GG. Use eccentric reducers to maintain top of pipe level.

HH. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

II. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.

JJ. Install valves with stems upright or horizontal, not inverted.

3.04 PIPE HANGERS AND SUPPORTS:

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.

C. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.

D. Support horizontal piping as scheduled.

E. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.

F. Place hangers within 12 inches (300 mm) of each horizontal elbow.

G. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

H. Support vertical piping at everyother floor. Support riser piping independently of connected horizontal piping. Provide neoprene isolators between pipe and riser clamp.

I. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

J. Provide copper plated hangers and supports for copper piping.

K. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide stainless steel or plastic coated hangers in Pool areas subject to chlorine atmosphere.

M. Equip pipe hangers for 8" pipe and larger, located in Mechanical Rooms, with 1" static deflection combination elastomeric spring hangers.

N. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

3.05 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.
5. 3 inch : Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. 4 inch: Maximum span, 10 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.
1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 10 feet; minimum rod size, 1/2 inch.

C. Hanger Spacing for Plastic Piping.
1. 1/2 inch: Maximum span, 42 inches; minimum rod size, 1/4 inch.
2. 3/4 inch: Maximum span, 45 inches; minimum rod size, 1/4 inch.
3. 1 inch: Maximum span, 51 inches; minimum rod size, 1/4 inch.
4. 1-1/4 inches: Maximum span, 57 inches; minimum rod size, 3/8 inch.
5. 1-1/2 inches: Maximum span, 63 inches; minimum rod size, 3/8 inch.
6. 2 inches: Maximum span, 69 inches; minimum rod size, 3/8 inch.

END OF SECTION

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.
   2. If receiver is provided, install in liquid line leaving receiver.
   3. Use line size on leaving side of liquid solenoid valves.

D. Valves:
   1. Use service valves on suction and discharge of compressors. Provide tamper resistant caps and provide tools necessary to user/owner to unlock caps.
   2. Use gage taps at compressor inlet and outlet.
   3. Use gage taps at hot gas bypass regulators, inlet and outlet.
   4. Use check valves on compressor discharge.
   5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
   2. Use a filter-drier on suction line just ahead of compressor.
   3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
   4. Use sealed filter-driers in low temperature systems.
   5. Use sealed filter-driers in systems utilizing hermetic compressors.
   6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
   7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
   8. Use filter-driers for each solenoid valve.

G. Solenoid Valves:
   1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
   2. Use in liquid line of single or multiple evaporator systems, and hot gas bypass lines.
   3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

1.02 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity. For each type of valve, refrigerant piping, and piping specialty.
   1. Include pressure drop, based on manufacturer's test data, for the following:
      a. Thermostatic expansion valves.
      b. Solenoid valves.
      c. Hot-gas bypass valves.
      d. Filter dryers.
      e. Strainers.
      f. Pressure-regulating valves.

B. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Test Reports: Indicate results of leak test, acid test, and evacuation test.

D. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

E. Submit welder's certification of compliance with ASME Boiler and Pressure Vessel Code-Section IX.

F. Installer's Qualification Statement.

G. Field quality-control reports.

1.03 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

1.04 MAINTENANCE

A. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Filter-Dryer Cartridges: One of each type and size.
   2. Refrigeration Oil Test Kits: One, each containing everything required to conduct one test.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

B. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

D. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

E. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.02 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a:
   1. Suction Lines for Air-Conditioning Applications: 115 psig.
   2. Suction Lines for Heat-Pump Applications: 225 psig.
   3. Hot-Gas and Liquid Lines: 225 psig.

B. Line Test Pressure for Refrigerant R-407C:
   1. Suction Lines for Air-Conditioning Applications: 230 psig.
   2. Suction Lines for Heat-Pump Applications: 380 psig.
   3. Hot-Gas and Liquid Lines: 380 psig.

C. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig.
   2. Suction Lines for Heat-Pump Applications: 535 psig.
   3. Hot-Gas and Liquid Lines: 535 psig.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   11. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:
   1. Henry Technologies; www.henrytech.com/#sle.
   2. Parker Hannifin/Refrigeration and Air Conditioning; www.parker.com/#sle.
   3. Sporlan, a Division of Parker Hannifin; www.parker.com/#sle.

B. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.05 VALVES

A. Manufacturers:
   1. Hansen Technologies Corporation; www.hantech.com/#sle.
   2. Henry Technologies; www.henrytech.com/#sle.
   3. Flomatic Valves; www.flomatic.com/#sle.

B. Service Valves:
   1. Forged brass body with copper stubs, tamper proof brass caps, removable valve core, flared or solder ends, for maximum pressure of 500 psi.

2.06 FILTER-DRIERS

A. Manufacturers:
   1. Flow Controls Division of Emerson Electric; www.emersonflowcontrols.com/#sle.
   2. Parker Hannifin/Refrigeration and Air Conditioning; www.parker.com/#sle.
   3. Sporlan, a Division of Parker Hannifin; www.parker.com/#sle.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina,activated charcoal, and filtration to 40 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Replaceable Core Type: Steel shell with removable cap.

2. Sealed Type: Copper shell.
3. Connections: As specified for applicable pipe type.

D. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

2.07 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
   1. Wall Outlet Size, Stucco and Masonry Applications: 7-1/2 inch wide by 10 inch high.
      a. Elastomeric Sleeve Diameter: 1-11/16 inch.
   2. Wall Outlet Size, Siding and Compact Applications: 6-7/8 inch wide by 3-7/8 inch high.
      a. Elastomeric Sleeve Diameter: 1-11/16 inch.
   3. Outlet Cover Color: Gray.
   4. Water Penetration: Comply with ASTM E331.
   5. Air Leakage: Comply with ASTM E283.
   6. Air Permeance: Comply with ASTM E2178.

B. Insulation Protection System: Mechanical line insulation and PVC cover.
   1. PVC Insulation Cover Color: Black with full-length velcro fastener.
   2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
   3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
   4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
   5. Flame Spread and Smoke Development Rating of 25/450: Comply with ASTM E84.
   6. Adhesive free.

2.08 REFRIGERANT TUBING KITS

A. Furnished by split system manufacturer.

B. Factory-rolled and -bundled, soft-copper tubing with tubing termination fittings at each end.

C. Standard one-piece length for connecting to indoor units.

D. Pre-insulated with flexible elastomeric insulation of thickness to comply with governing energy code and sufficient to eliminate condensation.

E. Factory Charge: Nitrogen

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 GENERAL INSTALLATION

A. Provide clearance for installation of insulation and access to valves and fittings.

B. Provide access to concealed valves and fittings.

C. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

D. Fully charge completed system with refrigerant after testing.

E. Provide electrical connection to solenoid valves.

F. Install sleeves for piping penetrations of walls, ceilings, and floors.

G. Install sleeve seals for piping penetrations of concrete walls and slabs.

H. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.03 VALVE AND SPECIALTY INSTALLATION

A. Install valves in suction and discharge lines of compressor.

B. Install service valves for gage tapes 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 indicate, install valves on inlet and outlet side of filter dryers.

E. Install refrigeration specialties in accordance with manufacturer's instructions.

F. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

G. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

3.04 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. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient. Diagonal runs are prohibited unless specifically indicated otherwise.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal. Install piping adjacent to machines to allow service and maintenance. Install piping free of sags and bends.

E. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Joints:
   1. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
   2. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
      a. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
      b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.
   3. 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 to restore full ID. Join pipe fittings and valves as follows:
      a. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
      b. 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.
   4. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.
   5. Welded Joints: Construct joints according to AWS D10.12M/D10.12.
   6. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

I. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

J. Flood piping system with nitrogen when brazing.

K. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

L. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.

M. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

N. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

O. 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.

3.05 PIPE HANGERS AND SUPPORTS:

A. Install in accordance with ASME B31.5.

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

F. Provide rubber in shear isolators at hangers/anchors.

3.06 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to not less than the pressures indicated in "Performance Requirements" Article for 24 hours. Perform final tests at 27 inches vacuum and 200 psi using electronic leak detector. Test to no leakage.

C. Prepare test and inspection reports.

3.07 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. 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.
   4. Charge system with a new filter-dryer core in charging line.

3.08 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. 1-3/8 inch OD: Maximum span, 6 feet; minimum rod size, 3/8 inch.
   4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   6. 2-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Air cooled condensing units.

C. Indoor air handler (fan & coil) units for duct connection.

D. Indoor ductless fan & coil units.

1.02 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Design Data: Indicate refrigerant pipe sizing.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

F. Project Record Documents: Record actual locations of components and connections.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Filters: One of each type and size.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.04 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.05 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period:
      a. For Compressor, Parts, & Labor: One year(s) from date of Substantial Completion

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation

B. York International Corporation / Johnson Controls

C. Daikin Applied

D. Bryant

2.02 SYSTEM DESIGN

A. Mini-Split System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump with variable capacity compressors.
   2. Provide insulated refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed.
   3. System shall have a self-diagnostic function and shall have automatic restart capability after a power failure has occurred.

B. Performance Requirements: See Drawings for additional requirements.
   1. Efficiency:
      a. Comply with ASHRAE Std 90.1-2013.

2.03 INDOOR UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired, and run tested unit consisting of cabinet, supply fan, factory wiring, piping, electronic modulating linear expansion device, controls, and accessories; wired for single power connection with control transformer.
   1. Cabinet:
      a. Heavy gauge galvanized steel and internally insulated.
   2. Supply Fan: Indoor fan statically and dynamically balanced to run on a single motor with permanently lubricated bearings. Direct-drive type.
   3. Air Filters: Removable, 1" thick, 30% efficient air filter unless otherwise indicated.
   4. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections. All coils shall be pressure tested at the factory. A drain pan level switch, designed to connect to the control board, shall be provided, and installed in the condensate pan to prevent condensate overflow.

2.04 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired, and run tested unit consisting of cabinet, supply fan, factory wiring, piping, electronic modulating linear expansion device, controls, and accessories; wired for single power connection with control transformer.
   1. Cabinet:
      a. Heavy gauge galvanized steel and internally insulated.
   2. Supply Fan: Indoor fan statically and dynamically balanced to run on a single motor with permanently lubricated bearings. Direct-drive type.
   3. Air Filters: Removable, washable air filter.

B. Evaporator Coils Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections. All coils shall be pressure tested at the factory. A drain pan level switch, designed to connect to the control board, shall be provided, and installed in the condensate pan to prevent condensate overflow.

2.05 OUTDOOR UNITS

A. Outdoor Units: The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls. The outdoor unit shall be controlled by a microprocessor and dedicated Electronic Expansion Valves shall be provided for capacity control during part load of the indoor unit. Easy access shall be afforded to all serviceable parts by removable access panels.
   1. Refrigerant: R-410A.
   2. Cabinet: Galvanized steel with baked enamel finish. Completely weatherproof and corrosion resistant. Steel mounting feet to allow bolting to a concrete pad or mounting bracket. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable codes.

B. Compressor: Hermetic, inverter driven, variable speed, high pressure control and internal thermal overload protection. Compressor shall be mounted as to avoid the transmission of vibration.

C. Air Cooled Condenser: Aluminum fin and copper tube coil with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
   1. Condenser Fans: Direct-drive propeller type with fan guard to prevent contact. Airflow shall be horizontal discharge.
   2. Condenser Fan Motor: Permanently lubricated

D. Mounting Pad: poured in place concrete pad, minimum 4 inches thick.

2.06 ACCESSORY EQUIPMENT

A. Wired, Wall-Mounted Controller: Microprocessor with the following features:
   1. Operating Mode: Cool, Fan, Heat, Auto, Dry.
   2. Fan Speed Setting.
   3. Temperature Setting.
   4. Airflow Direction/Louver Setting (if applicable).
   5. Schedule.
   6. Enable/Disable Local Operation.
   7. Password protection.
   8. Grouping of Indoor Units.
   9. Display:
      a. Actual room temperature.
      b. Programmed temperature.
      c. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.
      d. Fan Speed.
      e. Day of Week and Time.
      f. Error Code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install units level and plumb.

C. Install in accordance with NFPA 90A and NFPA 90B.

D. Install refrigeration systems in accordance with ASHRAE Std 15.

E. Install roof-mounted, compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

F. Install ground-mounted, compressor-condenser components on cast-in place concrete equipment base(s).

G. Install tubing to allow access to unit.

3.03 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

END OF SECTION

PART 1 GENERAL

1.01 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for manufactured products and assemblies. Indicate water, drain, thermostatic valves, and electrical rough-in connections with electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

D. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Filters: One set for each unit.

1.02 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.03 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Daikin Industries Co, Ltd

B. Friedrich Air Conditioning Co

C. Amana

D. Carrier

2.02 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, factory assembled, prewired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, discharge plenum, outside air connection, heating coil, air filters, and controls; fully charged with refrigerant and filled with oil.

B. Assembly: Up flow air delivery, in draw-through configuration as indicated.

2.03 CABINET

A. Frame and Panels: Galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners.

B. Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.

C. Drain Pan: Galvanized steel with corrosion-resistant coating.

2.04 EVAPORATOR FAN

A. Fan: Direct drive, double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, resiliently mounted.

2.05 COMPRESSOR

A. Hermetically sealed, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection.

2.06 EVAPORATOR COIL

A. Direct expansion coiling coil of seamless copper or aluminum tubes expanded into aluminum fins.

B. Refrigeration circuit with externally equalized thermal expansion valve, filter-drier, and charging valves.

2.07 CONDENSER

A. Co-Axial: Copper tube in copper tube or shell and tube with finned copper tubes in steel shell with water temperature actuated water regulating valve.

B. Terminate suction and liquid refrigerant piping with service valves within unit.

C. Fan: Double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, with permanently lubricated bearings.

2.08 HEATING COIL

A. Helical nickel-chrome resistance wire coil heating elements with refractory ceramic support bushings, with automatic reset thermal cut-out, built-in magnetic contactors, manual reset thermal cut-out, airflow proving device, load fuses.

2.09 AIR FILTERS

A. Easily removed one inch thick permanent cleanable panel filters.

2.10 CONTROLS

A. Factory wired controls shall include contactor, high and low pressure cutouts, internal winding thermostat for compressor, control circuit transformer, non-cycling reset relay.

B. Provide thermostat to cycle cooling and heating, mounted within unit with 'fan-off-cool-heat' switch allowing continuous fan operation, or cycling fan on call for cooling or heating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with requirements of NFPA 90A.

C. Pipe condensate from drain pan to nearest floor drain, or thru the wall to spill on grade, or to dry well as detailed on construction documents.

END OF SECTION

PART 1 GENERAL

1.01 SCOPE

A. Provisions of this section apply to all HVAC work.

PART 2 PRODUCTS

2.01 ELECTRIC WALL HEATERS

A. UL listed recessed convection heaters with finned sheathed heating elements, resiliently mounted direct driven propeller fan with motor heat shield, circuit breaker, concealed thermostat, concealed "On Off" switch, high limit controls, and junction box for connecting power wiring.

B. Cabinets: 16 gauge steel, with pencil proof welded steel bar grilles (bars 1/16" X 3/8" minimum). Equip cabinet with adjustable recessing frame. Finish: Baked enamel, over bonderizing. Architect will select the color from manufacturer's standard selections.

C. Electric Wall Heaters: 2 KW and larger, Markel 3400 Series, less than 2 KW, Markel Series 3420, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Units shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals Most Recent Edition Cited by Referring Code or Reference Standard.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.

C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2018.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Structural Performance: Casings shall be fabricated to withstand 133 percent of the indicated static pressure without structural failure. Wall and roof deflection at the indicated static pressure shall not exceed 1/8 inch per foot of width.
   1. Fabricate outdoor casings to withstand wind load of 15 lbf/sq. ft. and snow load of 30 lbf/sq. ft.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.03 SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives
   2. Sealants and gaskets

B. Shop Drawings: For ducts. Include plans, elevations, sections, components, and attachments to other work.
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Factory- and shop-fabricated ducts and fittings.
   3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
   4. Elevation of top of ducts.
   5. Dimensions of main duct runs from building grid lines.
   6. Fittings.
   7. Reinforcement and spacing.
   8. Seam and joint construction.
   9. Penetrations through fire-rated and other partitions.
   10. Equipment installation based on equipment being used on Project.
   11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
   13. Provide shop drawings for all mechanical rooms.

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

1.05 FIELD CONDITIONS, DELIVERY, STORAGE, AND HANDLING

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

C. Seal all joints and seams of ductwork as it is installed.

D. During construction, cover open ended ductwork sections to prevent dust and water from entering ductwork sections.

E. Do not store ductwork on site in direct contact with dirt, gravel, finished concrete floor, etc.

F. During construction, all return air, exhaust air, and outside air ductwork shall have temporary filter media installed over all openings. The mechanical contractor shall be responsible for providing temporary filter media and changing filter media on a bi-weekly basis during construction. The general contractor shall maintain a log of all temporary media and filter changes recording the following: Associated Unit Tag, Room Location, Filter Size & Quantity or Temporary Media Quantity, Date & Time of replacement, Mechanical Contractor signature, and General Contractor signature.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653.
   1. Galvanized Coating Designation: G90.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.
   3. Shore A Hardness: Minimum 20.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. VOC: Maximum 75 g/L (less water).
   7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   8. Service: Indoor or outdoor.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Base: Synthetic rubber resin.
   3. Solvent: Toluene and heptane.
   4. Solids Content: Minimum 60 percent.
   5. Shore A Hardness: Minimum 60.
   6. Water resistant.
   7. Mold and mildew resistant.

8. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
9. Service: Indoor or outdoor.
10. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.03 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.04 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.

B. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and first class manner from structural members (not roof deck) with adequate bracing and cross breaking to prevent breathing, rattling, and vibration.

C. Flexible ductwork is not allowed on return, exhaust, or outside air ductwork.

D. **Duct dimensions shown are clear inside dimensions. Increase sheet metal size to allow for liner thickness.**

E. Duct Sealing: Seal all duct seams and joints as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to United Duct Sealer.
1. Class "A" Seal: Seal all joints and seams and leak test as specified.
2. Class "B" Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.

3. Class "C" Seal: Seal entire circumference of all transverse joints.
4. Class "D" Seal: Seal corner of transverse joints.

F. Low Pressure Supply Ductwork and Outside Air Ductwork:
1. 2 inch w.g. pressure class.
2. Galvanized Steel.
3. Class "B" Seal.
4. Bolts, screws, and other fasteners shall not penetrate the ductwork.

G. Return and Relief Ductwork:
1. 2 inch w.g. pressure class.
2. Galvanized Steel.
3. Class "B" Seal.

H. Exhaust Ductwork:
1. 2 inch w.g. pressure class.
2. Galvanized Steel.
3. Class "B" Seal.

I. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, fiberglass ductboard.

2.05 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.

C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation

E. Duct Turns: Wherever possible, duct turns shall have a centerline radius equal to 1.5 times the duct width in the plane of the turn. Install turning vanes in other duct turns to provide a dynamic loss coefficient ("C") not greater than 0.2. Duct turns less than 20 degrees may be mitered. Do not use offsets that reduce the cross sectional area of the duct. Do not use reducing elbows or tees.

F. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

H. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

I. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.06 MANUFACTURED DUCTWORK AND FITTINGS

A. Round Ducts (concealed above ceilings): Round lockseam duct with galvanized steel outer wall.
1. Manufacture in accordance with SMACNA (DCS).

B. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film. Minimum R=6.0
2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: Minus 10 degrees F to 160 degrees F.
5. Flexible connectors shall not exceed 5 feet in length.
6. UL Listed as Class I Air Duct and Connector (UL 181)
7. Manufacturers:
a. Thermoflex

b. Technaflex
c. Flexmaster
d. Atco

PART 3 EXECUTION

3.01 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

M. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

N. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

O. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

P. Use double nuts and lock washers on threaded rod supports.

Q. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

R. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

S. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

T. Flexible duct is not allowed on return, exhaust, or outside air ductwork.

U. Bolts, screws, and other fasteners shall not penetrate the ductwork.

3.02 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

F. All ductwork exposed in finished spaces shall be provided with Paint grip finish. Paint color to be selected by Architect.

3.03 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.04 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

END OF SECTION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
   1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
      a. Special fittings.
      b. Manual volume damper installations.
      c. Control-damper installations.
      d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
      e. Duct security bars
      f. Wiring Diagrams: For power, signal and control wiring.
      g. Ceiling-mounted access panels/doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

D. Project Record Drawings: Record actual locations of access doors and test holes.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Fusible Links: Furnish two or quantity equal to 10 percent of amount installed, whichever is greater, of each type and size.

1.02 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.03 FIELD CONDITIONS, DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.02 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653.

B. Stainless-Steel Sheets: Comply with ASTM A 480, Type 304

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14;with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, 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 minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.03 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
   1. Carlisle HVAC Products; Dynair Hollow Vane and Rail (Double Wall Vane).
   2. Elgen Manufacturing, Inc.
   3. Krueger-HVAC, Division of Air System Components.
   4. Ruskin Company.
   5. Titus HVAC.

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

C. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.04 BACKDRAFT & PRESSURE RELIEF DAMPERS - METAL

A. Manufacturers:
   1. Louvers & Dampers, Inc.
   2. Nailor Industries, Inc.
   3. Ruskin Company.

B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with neoprene or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.05 DUCT ACCESS DOORS

A. Manufacturers:
   1. Acudor Products Inc.
   2. Ductmate Industries, Inc.
   3. MKT Metal Manufacturing.
   4. Nailor Industries, Inc.
   5. Ruskin Company.
   6. SEMCO LLC.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1-inch-thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.
   3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
   4. Larger Sizes: Provide an additional hinge.
   5. High Temperature Duct Access Doors:
      a. Comply with NFPA 96.
      b. Comply with UL 1978.

D. Access doors with sheet metal screw fasteners are not acceptable.

2.06 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 FIRE DAMPERS

A. Manufacturers:
   1. AireTechnologies, Inc.
   2. Nailor Industries, Inc.
   3. Ruskin Company.
   4. Greenheck

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Ceiling Radiation Dampers: Galvanized steel, 22 gage, 0.0299-inch frame and 16 gage, 0.0598-inch flap, two layers 0.125-inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
   1. Boot Fitting: Factory-provided el type (90 degree). Include field-provided collar.
   2. Box Fitting: Factory-provided 26 gage, 0.0179 inch with field-provided collar.
   3. Rated for three-hour service in compliance with UL 555C.

D. Horizontal Dampers: Galvanized steel, 22 gage, 0.0299-inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

F. Multiple Blade Dampers: 16 gage, 0.0598-inch galvanized steel frame and blades, oil-impregnated bronze or stainless-steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

G. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.08 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:
   1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric.
   2. Ductmate Industries, Inc.
   3. Elgen Manufacturing, Inc.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

D. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

E. Maximum Installed Length: 14 inch.

2.09 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Greenheck.
   2. Nailor Industries.
   3. Ruskin Company.

B. Fabricate in accordance with SMACNA (DCS) and as indicated. Standard leakage rating, with linkage outside of airstream. Suitable for horizontal or vertical applications.

C. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

D. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch.
   2. Blade: 24 gage, 0.0239 inch, minimum.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gage, 0.0478 inch, minimum.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

G. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

H. Constant Airflow Regulators:
   1. General Requirements:
      a. Provide bi-directional, air balancing regulator for pressure independent air volume control.
      b. Complies with UL 2043 for heat and smoke release.
      c. Complies with AMCA 500-D for the allowable leakage rates.
      d. Airflow regulator to be field adjustable.
   2. Construction:
      a. Nominal Diameter: 4 inch.
      b. Frame: Thermoplastic resin in compliance with UL 94.
      c. Blade: Thermoplastic resin in compliance with UL 94.
      d. Bearings: Hydraulic blade dampener.
      e. Outer Seal: Removable rubber gasket-type around circumference of damper.
      f. Spring: Stainless steel leaf-type.
      g. Temperature Range: 25 degrees F to 150 degrees F.
      h. Operating Range: 0.2 inch W.C. to 2.0 inch W.C..
   3. Optional Accessories:
      a. Provide airflow regulators with rectangular to round transitions.

2.10 MISCELLANEOUS PRODUCTS

A. Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.

B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
   1. Thickness: 2 mils.
   2. High tack water-based adhesive.
   3. UV stable light blue color.
   4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS).

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere

as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 by 8 inch size for hand access, 12 by 12 inch size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
   1. Refer to Section 220548.
   2. Refer to Section 230548.

J. For fans developing static pressures of 5.0 inches (1250 Pa) and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

K. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

L. Use splitter dampers only where indicated.

M. Provide balancing dampers on high velocity systems where indicated. Refer to Section 233600 - Air Terminal Units.

N. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Indicate installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Fan Belts: One set for each individual fan.

1.02 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.03 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes

B. Greenheck

C. Loren Cook Company

D. PennBarry

E. Twin City Fan & Blower

F. ACME

2.02 POWER VENTILATORS - GENERAL

A. Provide fans of class required for service based on static pressures 20% greater than those scheduled. All fans are to be rated for continuous duty.

B. Provide forward curved blade, radial blade, backward curved blade or air foil blade fans statically and dynamically balanced.

C. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

D. For all fans furnish adjustable motor bases or rails.

E. Size V belt drives for 50% overload, and provide adjustable pitch motor pulleys for drives of 15 BHP and smaller.

F. Provide belt and drive guards on all fans.

G. Provide scroll access doors with quick-operating latches for all exhaust fans.

H. Equip all fans with flanged inlets and outlets.

I. Sound power levels shall not exceed those scheduled or specified.

J. Size fan motors to provide at least 5% drive loss, with motor service factors not exceeding 1.0. Provide premium efficiency motors.

K. Where scheduled provide variable inlet vanes with rods extended for connection to control operators.

L. Where scheduled provide corrosion resistant coating consisting of two (2) coats of chlorinated rubber base paint on all parts in airstream.

M. Where shown on electrical drawings provide two (2) speed separate winding motors (1800/900 rpm).

N. Where shown on electrical drawings provide motors suitable for two (2) step increment starting.

O. All roof and wall mounted fans are to be factory painted, color to be selected by Architect.

P. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

Q. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

R. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

S. Fabrication: Conform to AMCA 99.

T. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

U. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

V. Enclosed Safety Switches: Conform to NEMA 250.

W. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.03 CABINET EXHAUST FANS

A. Construction (Loren Cook GC-100): The fan wheel housing and integral outlet duct shall be injection molded from an engineered resin. The outlet duct shall have provision for an aluminum backdraft damper. The inlet box shall be minimum 22 gauge galvanized steel. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided.

B. Fan Wheel (Loren Cook GC-100): Wheel shall be centrifugal forward curved type, injection molded of polypropylene resin.

C. Construction (Loren Cook GC-200 to GC-900): The fan housing shall be minimum 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel. Motor shall be mounted on vibration isolators. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and nylon bushings. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided.

D. Fan Wheel (Loren Cook GC-200 to GC-900): Wheel shall be centrifugal forward curved type, constructed of galvanized steel.

E. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.

F. Fan Speed Controller: Provide pre-wired 5A, 120 Volt fan speed controller. Fan speed controller shall be mounted on the fan or in location as shown on the construction documents.

G. Grille: Aluminum with baked white enamel finish.

H. Fan Motor: Motor shall be open drip proof type with permanently lubricated bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Hung Cabinet Fans:
   1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 220548.
   2. Install fans with resilient mountings and flexible electrical leads. Refer to Section 230548.
   3. Install flexible connections specified in Section 233300 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

H. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.

I. Provide exposed couplings with coupling guards.

J. All motors or other equipment exposed to weather shall be provided with weatherproof covers.

END OF SECTION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data for each type of product.
   1. Data Sheet: indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
   2. Diffuser Schedule: Submit schedule of outlets and inlets showing type, size, room location, accessories, and noise level.

1.02 CLOSEOUT DOCUMENTS

A. Project Record Documents: Record actual locations of air outlets and inlets.

1.03 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 GRILLES, REGISTERS, AND DIFFUSERS MANUFACTURERS

A. Titus

B. Metalaire

C. Price Industries

D. Krueger

E. Nailor

2.02 LOUVER MANUFACTURERS

A. Greenheck

B. NCA

C. Ruskin

D. Pottorf

2.03 GENERAL

A. Where fire dampers are required at grilles, provide steel grilles, not aluminum.

B. Grilles, Registers, and Diffusers Finishes:
   1. All diffusers and grilles located in lay-in ceilings: off-white enamel finish.
   2. All wall mounted grilles and registers: primer finish. (grilles and registers to be field painted by others.)
   3. All grilles and registers mounted on exposed ductwork: un-painted ductwork: mill finish
   4. All floor grilles: satin anodized finish.
   5. If there is a grille, register, or diffuser in a location other than what is described above, provide an off-white enamel finish.

C. Louver Finishes:
   1. Louver Finishes shall be selected by the Architect.
   2. Submit color chart to the Architect.

2.04 ROUND PLAQUE FACE CEILING DIFFUSERS

A. Type: Round, adjustable pattern, plaque face ceiling diffuser to discharge air in 360 degree pattern. Diffuser collar shall project not more than 1 inch above ceiling.

B. Fabrication: Outer cone and webbing is steel. Plaque is Aluminum.

C. Accessories: Radial opposed blade damper with damper adjustable from diffuser face.

D. Basis of Design: Titus R-Omni

2.05 RECTANGULAR LOUVER FACE CEILING DIFFUSERS

A. Type: Provide square, adjustable pattern, stamped, multi-core diffuser to discharge air in one way, two way, three-way, corner, or four-way discharge pattern. Four-way discharge shall be standard. See floor plans for direction of throw for anything other than four ways.

B. Connections: Round.

C. Frame: Provide lay-in border type. In plaster ceilings, provide plaster frame and ceiling frame. Coordinate border type with Architect's ceiling plans.

D. Fabrication: Aluminum with baked enamel finish.

E. Color: Standard off-white unless otherwise noted.

F. Accessories: Provide radial opposed blade volume control damper; removable core (latched in place) with damper adjustable from diffuser face.

G. Basis of Design: TDCA-AA (aluminum).

2.06 CEILING EGG CRATE EXHAUST, RETURN, AND TRANSFER GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.

B. Fabrication: Grid core consists of aluminum with baked enamel finish.

C. Color: Standard off-white unless otherwise noted.

D. Color: As selected by Architect. Submit color chart to the Architect.

E. Color: As selected by the Engineer from manufacturer's standard range.

F. Frame: 1 inch margin with countersunk screw mounting.

G. Frame: Channel lay-in frame for suspended grid ceilings.

H. Accessories: Provide integral, gang & face operated opposed blade damper.

I. Basis of Design: Titus 50F.

2.07 WALL SUPPLY REGISTERS

A. Construction: 20 gauge steel border and extruded aluminum blades.

B. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with two-way deflection.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

D. Fabrication: Aluminum extrusions with factory prime coat finish.

E. Color: Standard off-white unless otherwise noted.

F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

G. Basis of Design: Titus 272RL

2.08 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: Standard off-white unless otherwise noted.

E. Damper for Registers: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

F. For Grilles, same as above except no damper.

G. Basis of Design: Titus 350RL

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide manual volume dampers for balancing on duct take-off to all air outlets and inlets (diffusers, grilles, registers, etc), whether dampers are specified as part of the diffuser or grille and register assembly or not. All manual volume dampers may not be indicated on drawings.

C. Paint ductwork visible behind air outlets and inlets flat black.

D. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

E. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

3.02 DIFFUSERS, REGISTERS, & GRILLES

A. Examination
   1. Examine areas where diffusers, registers and grilles are installed for compliance for installation tolerances and other conditions affective performance of equipment.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation of Diffusers, Grilles, and Registers
   1. Install diffusers, registers, and grilles level and plumb.
   2. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
   3. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

C. Adjusting
   1. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

PART 1 GENERAL

1.01 SCOPE

A. Provisions of this section apply to all HVAC work.

PART 2 PRODUCTS

2.01 FILTERS - AIR

A. 30% Filters, 1" or 2" Thick (Maximum allowed by MFR): Throwaway deep pleated filters, maximum face velocity 350 fpm. Maximum initial pressure drop 0.1" WG, UL Class 1, 30% efficiency per ASHRAE Test Standard 52-76, minimum ratio of media area to face area 4.4:1. Turn system over to Owner with clean filters and provide one (1) set of spare filters. Farr 30/30 or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Filters shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC - SECTION 15928

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Manufacturer's Instructions: Provide for all manufactured components.

C. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Thermostats and Other Exposed Sensors: One of each type.

1.02 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.03 WARRANTY

A. Correct defective Work within a one-year period after Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. KMC Controls

2.02 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 PERFORMANCE REQUIREMENTS – GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

D. Environmental Conditions:
   1. Provide electric actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.
      a. Hazardous Locations: Explosion-proof rating for condition.

2.04 DAMPERS

A. Performance Requirements:
   1. Test in accordance with AMCA 500-D.
   2. Selection Criteria:

a. Dampers shall have stable operation throughout full range of operation, from design to minimum airflow over varying pressures and temperatures encountered.
b. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch.

C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, 0.0299 inch, attached to minimum 1/2-inch shafts with set screws.
1. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.

D. Blade Seals: Synthetic elastomeric inflatable mechanically attached; field replaceable.

E. Jamb Seals: Spring stainless steel.

F. Shaft Bearings: Oil impregnated sintered bronze.

G. Linkage Bearings: Oil impregnated sintered bronze.

H. Leakage: Less than one percent based on approach velocity of 2000 ft/min and 4 inches wg.

I. Maximum Pressure Differential: 6 inches wg.

J. Temperature Limits: -40 to 200 degrees F.

K. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.

L. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.

M. Airflow Measurement:
1. Where indicated, provide damper assembly with integral airflow monitoring.
2. Zero- to 10-V dc or 4- to 20-mA scaled output signal for remote monitoring of actual airflow.
3. Accuracy shall be within 5 percent of the actual flow rate between the range of minimum and design airflow. For applications with a large variation in range between the minimum and design airflow, configure the damper sections and flow measurement assembly as required to comply with the stated accuracy over the entire modulating range.
4. Provide a straightening device as part of the flow measurement assembly to achieve the specified accuracy with configuration indicated.
5. Suitable for operation in untreated and unfiltered air.
6. Provide temperature and altitude compensation and correction to maintain accuracy over temperature range encountered at site altitude.
7. Provide automatic zeroing feature.

N. Airflow Control:
1. Where indicated, provide damper assembly with integral airflow measurement and control.
2. A factory-furnished and -calibrated controller shall be programmed, in nonvolatile EPROM, with application-specific airflow set point and range.
3. The controller and actuator shall communicate to control the desired airflow.
4. The controller shall receive a zero- to 10-V dc input signal and report a zero- to 20-mA output signal that is proportional to the airflow.
5. Airflow measurement and control range shall be suitable for operation between 150 to 2000 fpm.
6. Ambient Operating Temperature Range: Minus 40 to plus 140 deg F.
7. Ambient Operating Humidity Range: 5 to 95 percent relative humidity, non-condensing.

8. Provide unit with control transformer rated for not less than 85 VA. Provide transformer with primary and secondary protection and primary disconnecting means. Coordinate requirements with field power connection.
9. Provide screw terminals for interface to field wiring.
10. Factory mount electronics within a NEMA 250, Type 1 painted steel enclosure.

2.05 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
   1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
   2. Provide one operator for maximum 36 sq ft damper section.
   3. Actuators shall operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.
   4. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the fan shutoff pressure as a minimum requirement.
   5. The total damper area operated by an actuator shall not exceed 80 percent of manufacturer's maximum area rating.
   6. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison.
   7. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.
   8. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.
   9. Provide mounting hardware and linkages for connecting actuator to damper.
   10. Select actuators to fail in desired position in the event of a power failure.

B. Electric and Electronic Actuators:
   1. Type: Motor operated, with or without gears, electric and electronic.
   2. Construction:
      a. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
      b. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
      c. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.
   3. Field Adjustment:
      a. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
      b. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.
   4. Two-Position Actuators: Single direction, spring return or reversing type.
   5. Modulating Actuators:
      a. Capable of stopping at all points across full range and starting in either direction from any point in range.
      b. Control Input Signal:
         1) Three Point, Tristate, or Floating Point: Clockwise and counterclockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
         2) Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation.
         3) Pulse Width Modulation (PWM): Actuator drives to a specified position according to a pulse duration (length) of signal from a dry-contact closure, triac sink or source controller.

4) Programmable Multi-Function:
   (a) Control input, position feedback, and running time shall be factory or field programmable.
   (b) Diagnostic feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
   (c) Service data, including at a minimum, number of hours powered and number of hours in motion.

6. Fail-Safe:
   a. Where indicated, provide actuator to fail to an end position.
   b. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
   c. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.
7. Integral Overload Protection:
   a. Provide against overload throughout the entire operating range in both directions.
   b. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.
8. Damper Attachment:
   a. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
   b. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
   c. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.
9. Stroke Time:
   a. Operate damper from fully closed to fully open within 60 seconds.
   b. Move damper to failed position within 15 seconds.
   c. Select operating speed to be compatible with equipment and system operation.
   d. Actuators operating in smoke control systems comply with governing code and NFPA requirements.
10. Sound:
   a. Spring Return: 62 dBA.
   b. Non-Spring Return: 45 dBA.

2.06 HUMIDISTATS

A. Room Humidistats:
   1. Wall mounted, proportioning type.
   2. Mount on wall with top of device at 48" a.f.f.
   3. Throttling range: Adjustable 2 percent relative humidity.
   4. Operating range: 30 to 80 percent.
   5. Maximum temperature: 110 degrees F.
   6. Cover: Set point indication.

B. Limit Duct Humidistat:
   1. Insertion, two position type.
   2. Throttling range: Adjustable 2 percent relative humidity.
   3. Operating range: 20 to 80 percent.
   4. Maximum temperature: 150 degrees F.

2.07 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
   1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
   2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
   3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
   4. Temperature sensing device must be compatible with project DDC controllers.
   5. Performance Characteristics:

a. RTD:
    1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
    2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
    3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
    4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
    5) Range: Minus 40 degrees F through 220 degrees F minimum.
b. Thermistor:
    1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
    2) Range: Minus 25 degrees F through 122 degrees F minimum.
    3) Heat Dissipation Constant: 2.7 mW per degree C.
c. Temperature Transmitter:
    1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
    2) Output: 4 - 20 mA.
d. Sensing Range:
    1) Provide limited range sensors if required to sense the range expected for a respective point.
    2) Use RTD type sensors for extended ranges beyond minus 30 degrees F to 230 degrees F.
    3) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
e. Wire Resistance:
    1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.
    2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.
f. Room Sensors: Locking cover where indicated on plans.
g. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
h. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
i. Ceiling and Recessed Mount Temperature Sensors: Ceiling-mounted sensor in a low-profile housing.
j. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.
k. Room Temperature Sensors:
    1) Construct for wall box mounting.
    2) Mount on wall with top of device at 48" a.f.f.
    3) Provide high impact ABS plastic housing.
    4) Provide the following:
        (a) Setpoint reset slide switch with an adjustable temperature range.
        (b) Individual heating/cooling setpoint slide switches.
        (c) Momentary override request push button for activation of after-hours operation.
        (d) Analog thermometer.
l. Room Temperature Sensors with Integral Digital Display:
    1) Construct for wall box mounting.
    2) Mount on wall with top of device at 48" a.f.f.
    3) Provide high impact ABS plastic housing.
    4) Provide a four button keypad with the following capabilities:
        (a) Indication of space and outdoor temperatures.
        (b) Setpoint adjustment to accommodate room setpoint.
        (c) Display and control fan operation status.
        (d) Manual occupancy override and indication of occupancy status.
        (e) Controller mode status.
        (f) Password enabled setpoint and override modes.
m. Temperature Averaging Elements:
    1) Use on duct sensors for ductwork 10 sq ft or larger.

2) Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.
3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.

n. Insertion Elements:
1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches.
2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

B. Humidity Sensors:
1. Input Power, Voltage Type: Class 2; 12-30 VDC/24 VAC, 15mA max.
2. Input Power, mA Type: Class 2; Loop powered 12-30 VDC only, 30 mA max.
3. Output Voltage type: 3-wire observed polarity.
4. Output mA type: 2-wire, not polarity sensitive (clipped and capped).
5. Humidity:
a. HS Element: Digitally profiled thin-film capacitive.
b. Accuracy 1 percent at 10 to 80 percent relative humidity at 77 degrees F, multi-point calibration, NIST traceable.
1) Plus/minus 1 percent at 20-40 percent RH in mA output mode; (multi-point calibration, NIST traceable).
c. Scaling: 0-100 percent RH.
6. Temperature Effect:
a. Duct Mounted: Plus/minus 0.18 percent per degree F.
b. Outdoor Mounted: 4-20mA version: (0.0013x%RHx(TdegreeC-25)).
7. Hysteresis: 1.5 percent typical.
8. Linearity: Included in accuracy specification.
9. Reset Rate: 24 hours.
10. Stability: Plus/minus 1 percent @ 68 degrees F annually, for two years.
11. Temperature Monitoring:
a. Temperature Transmitter Output: Digital, 4-20mA (clipped & capped) or 0-5V/0-10V output.
1) HO Transmitter Accuracy: Plus/minus 2.3 degrees F.
2) HD Transmitter Accuracy: Plus/minus 1.0 degree F.
12. Operating Environment:
a. Operating Humidity Range: 0 to 100 percent RH noncondensing.
b. Operating Temperature Range: Minus 40 degrees F to 122 degrees F.
13. Wall Mounted Sensor: Voltage type encased in a High impact ABS plastic housing.

C. Carbon Dioxide Sensors, Duct and Wall:
1. Air Temperature: Range of 32 to 122 degrees F.
2. Relative Humidity: Range of 0 to 95 percent (non-condensing).
3. Power Input: Class 2; 12 to 30VDC or 24VAC 50/60 Hz; 100mA max.
4. Calibration Characteristics:
a. Automatically compensating algorithm for sensor drift due to sensor degradation.
b. Maximum Drift: 2 percent.
c. User calibratable with a minimum calibration interval of 5 years.
5. Construction:
a. Sensor Chamber: Non-corrosive material for neutral effect on carbon dioxide sample.
b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
c. Housing: High impact plastic.
6. Optional Equipment
a. Temperature Sensor:
1) Solid state, integrated circuit; Accuracy: Plus/minus 1 degree F; Resolution: 0.2 degrees F; Output Range: 50 to 95 degrees F.

2.08 THERMOSTATS

A. Electric Room Thermostats:
   1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
   2. Service: Cooling and heating.
   3. Covers: Locking with set point adjustment, with thermometer.

B. Line Voltage Thermostats:
   1. Integral manual On/Off/Auto selector switch, single or two pole as required.
   2. Dead band: Maximum 2 degrees F.
   3. Cover: Locking with set point adjustment, with thermometer.
   4. Rating: Motor load.

C. Room Thermostat Accessories:
   1. Thermostat Covers: Brushed aluminum.
   2. Insulating Bases: For thermostats located on exterior walls.
   3. Mount on wall with top of device at 48" a.f.f.
   4. Thermostat Guards: Metal mounted on separate base.
   5. Adjusting Key: As required for device.
   6. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

D. Outdoor Reset Thermostat:
   1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
   2. Scale range: -10 to 70 degrees F.

E. Immersion Thermostat:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

F. Airstream Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
   2. Averaging service remote bulb element: 7.5 feet.

G. Electric Low Limit Duct Thermostat:
   1. Snap acting, single pole, single throw, automatic reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

H. Electric High Limit Duct Thermostat:
   1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

I. Fire Thermostats:
   1. Normally closed contacts, manual reset.

J. Heating/Cooling Valve Top Thermostats:
   1. Proportional acting for proportional flow, molded rubber diaphragm, remote bulb liquid filled element, direct and reverse acting at differential pressure to 25 psig, cast housing with position indicator and adjusting knob.

2.09 TIME CLOCKS

A. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.

B. Solid state programmable time control with 24-hour battery carry over.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Furnish and install products required to satisfy most stringent requirements indicated.

C. Install products level, plumb, parallel, and perpendicular with building construction.

D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.

F. Fastening Hardware:
   1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
   2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
   3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

G. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

H. Check and verify location of thermostats with plans and room details before installation. Locate top of thermostat 48 inches above floor.

I. Mount freeze protection thermostats using flanges and element holders.

J. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

K. Provide separable sockets for liquids and flanges for air bulb elements.

L. Provide thermostats in locking covers where indicated.

M. Provide guards on thermostats in entrances.

N. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

O. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors. Provide separate minimum outside air damper section adjacent to return air dampers with separate damper motor.

P. Provide isolation (two position) dampers of parallel blade construction.

Q. Provide pilot positioners on pneumatic damper operators sequenced with other controls.

R. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

3.03 CONTROL DAMPERS

A. Install smooth transitions, not exceeding 30 degrees, to dampers smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.

B. Clearance:
   1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
   2. Install dampers with at least 24 inches of clear space on sides of dampers requiring service access.

C. Service Access:
   1. Dampers and actuators shall be accessible for visual inspection and service.
   2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator.

D. Install dampers straight and true, level in all planes, and square in all dimensions. Install supplementary structural steel reinforcement for large multiple-section dampers if factory support alone cannot handle loading.

E. Attach actuator(s) to damper drive shaft.

F. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

G. Checkout Procedures:
   1. Check installed products before continuity tests, leak tests, and calibration.
   2. Check dampers for proper location and accessibility.
   3. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.
   4. Verify that control dampers are installed correctly for flow direction.
   5. Verify that proper blade alignment, either parallel or opposed, has been provided.
   6. Verify that damper frame attachment is properly secured and sealed.
   7. Verify that damper actuator and linkage attachment are secure.
   8. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
   9. Verify that damper blade travel is unobstructed.

H. Adjustment, Calibration, and Testing:
   1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.
   2. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressure.
   3. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.
   4. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

3.04 TEMPERATURE INSTRUMENTS

A. Mounting Location:
   1. Roughing In:
      a. Outline instrument mounting locations before setting instruments and routing cable, wiring, tubing, and conduit to final location.
      b. Provide independent inspection to confirm that proposed mounting locations comply with requirements indicated and approved submittals.
         1) Indicate dimensioned locations with mounting height for all surface-mounted products on Shop Drawings.
         2) Do not begin installation without submittal approval of mounting location.
      c. Complete installation rough-in only after confirmation by independent inspection is complete and approval of location is documented for review by Owner and Architect on request.
   2. Install switches and transmitters for air and liquid temperature associated with individual air-handling units and associated connected ductwork and piping near air-handling units co-located in air-handling unit system control panel to provide service personnel a single and convenient location for inspection and service.

3. Install liquid and steam temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
4. Install air temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
5. Mount switches and transmitters on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.

B. Special Mounting Requirements:
1. Protect products installed outdoors from solar radiation, building and wind effect with stand-offs and shields constructed of Type 316 stainless.
2. Temperature instruments having performance impacted by temperature of mounting substrate shall be isolated with an insulating barrier located between instrument and substrate to eliminate effect. Where instruments requiring insulation are located in finished space, conceal insulating barrier in a cover matching the instrument cover.

C. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

D. Space Temperature Sensor Installation:
1. Conceal assembly in an electrical box of sufficient size to house sensor and transmitter, if provided.
2. Install electrical box with a faceplate to match sensor cover if sensor cover does not completely cover electrical box.
3. In finished areas, recess electrical box within wall.
4. In unfinished areas, electrical box may be surface mounted if electrical light switches are surface mounted. Use a cast-aluminum electric box for surface-mounted installations.
5. Align electrical box with other electrical devices such as visual alarms and light switches located in the vicinity to provide a neat and well-thought-out arrangement. Where possible, align in both horizontal and vertical axis.

E. Outdoor Air Temperature Sensor Installation:
1. Mount sensor in a discrete location facing north.
2. Protect installed sensor from solar radiation and other influences that could impact performance.
3. If required to have a transmitter, mount transmitter remote from sensor in an accessible and serviceable location indoors.

F. Single-Point Duct Temperature Sensor Installation:
1. Install single-point-type, duct-mounted, supply- and return-air temperature sensors. Install sensors in ducts with sensitive portion of the element installed in center of duct cross section and located to sense near average temperature. Do not exceed 24 inches in sensor length.
2. Install return-air sensor in location that senses return-air temperature without influence from outdoor or mixed air.
3. Rigidly support sensor to duct and seal penetration airtight.
4. If required to have transmitter, mount transmitter remote from sensor at accessible and serviceable location.

G. Averaging Duct Temperature Sensor Installation:
1. Install averaging-type air temperature sensor for temperature sensors located within air-handling units, similar equipment, and large ducts with air tunnel cross-sectional area of 20 sq. ft. nd larger.
2. Install sensor length to maintain coverage over entire cross-sectional area. Install multiple sensors where required to maintain the minimum coverage.
3. Fasten and support sensor with manufacturer-furnished clips to keep sensor taut throughout entire length.

4. If required to have transmitter, mount transmitter in an accessible and serviceable location.

H. Low-Limit Air Temperature Switch Installation:
   1. Install multiple low-limit switches to maintain coverage over entire cross-sectional area of air tunnel.
   2. Fasten and support sensing element with manufacturer-furnished clips to keep element taut throughout entire length.
   3. Mount switches outside of airstream at a location and mounting height to provide easy access for switch set-point adjustment and manual reset.
   4. Install on entering side of cooling coil unless otherwise indicated on Drawings.

I. Liquid Temperature Sensor Installation:
   1. Assembly shall include sensor, thermowell[and connection head].
   2. For pipe NPS 4 and larger, install sensor and thermowell length to extend into pipe between 50 to 75 percent of pipe cross section.
   3. For pipe smaller than NPS 4:
      a. Install reducers to increase pipe size to NPS 4 at point of thermowell installation.
      b. For pipe sizes NPS 2-1/2 and NPS 3, thermowell and sensor may be installed at pipe elbow or tee to achieve manufacturer-recommended immersion depth in lieu of increasing pipe size.
      c. Minimum insertion depth shall be 2-1/2 inches.
   4. Install matching thermowell.
   5. Fill thermowell with heat-transfer fluid before inserting sensor.
   6. Tip of spring-loaded sensors shall contact inside of thermowell.
   7. For insulated piping, install thermowells with extension neck to extend beyond face of insulation.
   8. Install thermowell in top dead center of horizontal pipe positioned in an accessible location to allow for inspection and replacement. If top dead center location is not possible due to field constraints, install thermowell at location along top half of pipe.

J. Checkout Procedures:
   1. Check installed products before continuity tests, leak tests, and calibration.
   2. Check temperature instruments for proper location and accessibility.
   3. Verify sensing element type and proper material.
   4. Verify location and length.
   5. Verify that wiring is correct and secure.

K. Adjustment, Calibration, and Testing:
   1. Description:
      a. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
      b. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
      c. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
      d. Equipment and procedures used for calibration shall meet instrument manufacturer's written instructions.
      e. Provide diagnostic and test equipment for calibration and adjustment.
      f. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
      g. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
      h. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.
      i. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements and to supplement requirements indicated.

2. Analog Signals:
    a. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
    b. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
    c. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistance source.
    d. Digital Signals:
    e. Check digital signals using a jumper wire.
    f. Check digital signals using an ohmmeter to test for contact.
    g. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.
    h. Switches: Calibrate switches to make or break contact at set points indicated.
3. Transmitters:
    a. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
    b. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistance source.

3.05 MAINTENANCE

A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

END OF SECTION

1.0 - GENERAL

1.1 SUMMARY

A. This Section includes the following plumbing identification materials and their installation:

1. Pipe markers.
2. Valve tags.
3. Valve schedules.
4. Equipment labels.
5. Warning signs and labels.

1.2 SUBMITTALS

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

B. Valve numbering scheme.

C. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

2.0 - PRODUCTS

2.1 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.

4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.

5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Self-Adhesive Pipe Markers: Are not allowed

2.2 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.

2. Valve-Tag Fasteners: Brass wire-link chain, beaded chain or S-hook.

2.3 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.

2. Frame: Extruded aluminum.

3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.4 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

2. Color Coding:

System	Background Color	Letters
Other equipment	Black	White

3. Temperatures up to 160 deg F.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Letter shall be a minimum of 1/2" high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

6. Fasteners: Stainless-steel self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.5 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: Minimum 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information as indicated elsewhere in the specifications and on the Drawings.

3.0 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, [**at least ¾ inch**] [**1-1/2 inches**] wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.

4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

a. Cold Water: **2 inches square**.

b. Hot /HWR Water: **2 inches square**.

2. Valve-Tag Color:

a. Cold Water: **Natural**.

b. Hot Water: **Blue**.

3. Letter Color:

a. Cold Water: White

b. Hot Water: **White**.

3.4 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

END OF SECTION 15405

1.0 - GENERAL:

1.1 SCOPE:

A. Provisions of this Section apply to all Plumbing work.

B. Include the provisions of General, Supplementary and Special Conditions and provisions of the Specifications shall apply to and form a part of this Section.

C. Provide all labor, materials, equipment, and services necessary for the completion of all work shown or specified, except work specifically specified to be done or furnished under other sections of the Specifications. Include performing all operations in connection with the complete installation in strict accordance with the specification and applicable drawings subject to the terms and conditions of the Contract, for the following system:

1. A system of sanitary waste and vent piping.

2. A system of domestic water piping.

D. Give required notices, file drawings obtain and pay for permits, deposits and fees necessary for the installation of the work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.

E. "Provide" means to furnish and install, complete and ready for operation.

1.2 DRAWINGS:

A. Drawings are diagrammatic and subject to requirements of Architectural Drawings. Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work. Coordinate with Architectural, Structural, Electrical, HVAC and other Building Drawings.

B. Follow the Drawings closely, check dimensions with Architectural Drawings and field conditions. DO NOT scale Drawings for location of system components.

C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mis-located work.

D. Do not scale Drawings to locate sprinkler heads. Coordinate with lighting, ceiling grids, ceiling diffusers and/or reflected ceiling plans. Install Sprinkler Heads in center of ceiling tiles.

1.3 APPLICABLE CODES AND STANDARDS:

A. Comply with the current editions of the following Codes and Standards:

1. ANSI/ASHRAE 15 - Code for Building Services Piping.

2. NFPA 70 - National Electrical Code.

3. NFPA 101 – National Life Safety Code.

4. Other Standards as referenced in other Sections of Division 15.

5. Local Building Code (International Building Code if no local Building Code in effect).

6. Local Plumbing Code (International Plumbing Code if no local Plumbing Code is in effect).

7. NFPA 110 - Emergency and standby power.

1.4 QUALIFICATIONS OF SUBCONTRACTOR:

A. The Plumbing Contractor shall meet the following qualifications:

1. The Plumbing Contractor must be approved by the Architect.

2. The Plumbing Contractor shall have been in business as a Plumbing Contractor for at least three (3) years prior to Bid Date. He shall have a current Master's Plumber's Certificate and Gas Certificate of competency issued by the State of Alabama and the city and county in which work occurs.

3. The Plumbing Contractor shall have a satisfactory experience record with Plumbing installations of character and scope comparable with this project, and for at least three (3) years prior to the Bid Date and shall have had an established service department capable of providing service inspection or full maintenance contracts.

1.5 CONFLICTS AND INTERFERENCES:

A. If systems interfere or conflicts, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.6 WORKMANSHIP:

A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.7 COOPERATION:

A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.8 VISITING SITE:

A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

2.0 - PRODUCTS:

2.1 MATERIALS, SUBSTITUTIONS AND SUBMITTALS:

A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Equipment and materials furnished shall be fabricated by manufacturers regularly engaged in their production and shall be the standard and current model for which replacement parts are available. Equipment shall be substantially the same equipment of a given manufacturer which has been in successful commercial use and operation for at least three (3) years.

B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the Bid, without substitution, and shall be furnished under the Contract unless requests for substitutions are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.

C. Substitutions will be considered only if written request for approval has been received by the Architect TEN (10) DAYS prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which substitution is proposed and a complete description of the proposed substitute including drawings, cuts, performance and test data, samples and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

D. If the Architect approves any proposed substitution prior to receipt of Proposals, approval will be set forth in an Addendum. DO NOT rely upon approvals made in any other manner.

E. No substitutions will be considered after the Contract has been executed, except as described in the General Conditions.

F. Submittal data and shop drawings shall be submitted at one time, partial submittals will not be considered. Within 30 days of execution of Contract and before ordering materials and equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Number of Shop Drawings and procedure shall be as directed by the Architect.

G. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.

H. Similar items of equipment shall be the product of the same Manufacturer.

I. See section, "ALTERNATES" in other sections of the Specifications and Bid accordingly.

2.2 SHOP DRAWINGS:

A. Before starting work, submit and obtain approval of the following:

1. Equipment piping.

2. Plumbing Equipment, Products and Fixtures.

2.3 RECORD DRAWINGS:

A. When work starts obtain from Architect two (2) complete sets of white prints of the **Plumbing.** All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.

B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one (1) complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this Contract.

C. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.

D. When work is completed Contractor shall purchase from the Architect (At Architects' printing cost) one (1) set of reproducible electronic files and prints of Plumbing Drawings for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the dwg record drawings, removing all superseded data in order to show the actual completed conditions.

1. Accurately show location, size and elevation of new exterior piping work and its relationship to any existing piping and utilities, obstructions, etc., contiguous to the area of work.

2. Block out areas modified by change-order and identify them by change-order number.

2.4 ELECTRICAL EQUIPMENT:

A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.

B. Should the Contractor with the Architect's/Engineer's approval make changes in electrical equipment from those shown on the Electrical Drawings, he shall be responsible for the coordination and cost of required changes.

C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

D. Verify electrical characteristics of all equipment and voltages available with Electrical Section prior to ordering any electrical equipment.

2.5 SLEEVES:

A. Refer to the Architectural Life Safety Drawings for wall ratings and close all openings to match rating of wall.

B. Submit details of all pipe penetrations thru rated walls indicating wall construction, penetrating material and method of closing penetration including materials and listing of detail.

C. All Penetrations thru walls are to be closed. If the wall is not rated, sheet rock joint compound may be used to close space around piping. For walls with ratings opening shall be closed with a U.L. Listed rating system compatible with wall rating. Insulation is to be continuous thru all openings.

D. For pipe through floors inside rated chases or through non-fire-rated walls: 20 gauge galvanized steel sleeve 1/2" larger than pipe or pipe covering. Pipe insulation to be continuous thru sleeve. Seal opening between sleeve and pipe or pipe covering

E. For uninsulated pipe through 2 hour fire rated walls, partitions or floors outside chases: Hilti FS605 with sleeve, U.L. Listing #WL1056.

F. For insulated pipe passing through fire rated partitions or walls or floors outside chases: Hilti #FS611A with no sleeve, U.L. Listing #WL5029. Insulation: 1" thick fiberglass continuous thru wall.

G. For pipe passing thru concrete floor, concrete walls, and concrete block walls:

1. Uninsulated Schedule 40 steel and copper: Hilti #FS605 with sleeve, U.L. #CAT1155.

2. Insulated Schedule 40 steel and copper: Hilti #FS611A, U.L. #CAT5045.

H. For 4" and smaller PVC pipe passing thru 3 hour concrete floor, wall or concrete

block wall - Hilti #FS611A with collar, UL System #CAJ095.

I. For 2" and smaller Schedule 40 PVC pipe penetrating a 1H12 concrete floor or wall - Hilti #FS611A sealant, UL #CAT2062 or UL #CAJ2066.

J. Under this Section, the Contractor shall be responsible for closing and making fire safe all openings exposed during construction (both new and existing) in the floor and deck above. Closing of opening shall be compatible with rating and shall not compromise the rating of the wall or floor being sealed.

K. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.

L. In Mechanical Rooms extend sleeves 1-1/2" above finish floor and waterproof.

M. Where exposed pipes pass through walls and partitions in finished or exposed spaces, provide chrome plated F & C plates or escutcheons. Seal wall penetration and case work penetration with silicone prior to installing escutcheon.

N. All wall floor penetrations shall be closed in a neat manner. The method used to the close penetrations shall be compatible with the rating of the wall and shall in no way compromise the integrity of the partition or floor.

2.6 ACCESS DOORS:

A. Provide access doors for valves, and other items requiring maintenance located above hard ceilings or behind partitions or walls. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Provide door styles, sizes and colors as specified under the Architectural section.

B. Mark lay-in ceilings with paper brads at valve locations and maintenance access points. Bend ends of brads over above ceiling tile.

3.0 - EXECUTION:

3.1 PROTECTION OF EQUIPMENT:

A. During construction all fixtures and equipment shall be protected from damage caused by weather, masonry, plaster, paint and job accidents.

B. When installation is complete, clean equipment and make ready for painting. Adjust all flush valves.

3.2 INSTALLATION OF FIXTURES AND EQUIPMENT:

A. Install fixtures and equipment to provide normal service access to all components.

B. Provide sufficient space for removing components, install fixtures and equipment to provide such clearance.

C. Install fixtures and equipment in accordance with manufacturer's instructions. If manufacture's instructions conflict with contract documents, obtain Architect's decision before proceeding.

D. All fixtures and equipment shall be firmly fastened in place:

1. All wall hung fixtures shall be installed on a floor mounted fixture support with anchoring bolts in all holes of each leg. Bolts shall be sized as per manufacturer's recommendation.

3.3 CUTTING AND PATCHING:

A. Set sleeves and inserts and lay-out and form openings in walls, beams, girders and structural floors in this Section.

B. Cut, patch and repair as required to accomplish work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

C. Cutting, patching and repairing of walls, floors, etc., where noted in paragraph "A" above, have been located or sized incorrectly are included in this Section.

3.4 INCIDENTAL WORK:

A. All power wiring is included in Electrical Section.

B. Permanent drain and relief connections for **Plumbing Equipment** to nearest floor drain or to grade are included in this Section whether shown or not.

C. Items obviously omitted from drawings and/or specifications shall be called to attention of the Architect prior to submitting Bid, after award of Contract any changes or rearrangements necessary to complete Contract shall be at no additional cost to Owner.

3.5 FLASHING:

A. Vent Pipe and Roof Drain Flashing: Specified in "Architectural Roofing Section".

B. Coordinate all roofing penetrations with Roofing Section.

3.6 EXCAVATION AND BACKFILLING:

A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.

B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. Do not use piers to support piping.

C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas with "Engineered Fill", sand or fine gravel in accordance with requirements of "Sitework". Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, to meet the requirements of the authority having jurisdiction.

3.7 PAINTING:

A. Refinish equipment damaged during construction to new condition.

B. Paint all non-potable water pipe and insulation with two (2) coats of bright yellow paint in compliance with the Local Plumbing Code and these specifications. Paint piping prior to installing insulation. Paint type to be equal to Paint Specified in Painting Section of the Specifications.

C. Other painting is specified in "PAINTING SECTION, Finishes Division".

3.8 PIPE IDENTIFICATIONS:

A. Identify all piping exposed to view or accessible through removable ceilings or access

panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.

B. Submit samples of all nameplates, tags, chains and etc., for approval.

C. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.

D. Label Spacing and Extent:

1. On straight run of pipes; Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.

2. Wherever a pipe enters or leaves a room or building.

3. At change of direction.

4. At main valves and control valves (not equipment valves).

5. On risers, just above and below floors.

3.9 VALVE TAGS:

A. 2" X 3" laminated plastic with 1/2" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.

B. Valve tags colors:

1. Plumbing: Red tags with white numbers.

C. Valve tag locations: At all valves on mains, risers and branches.

D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building. In existing building extend existing sequences.

E. Starting with Number 1, number valve tags on this floor extending existing sequence. If there are no valve tags on existing valve, provide tags for all existing valves and new valves beginning floor sequence with Number 1.

3.10 VALVE CHARTS:

A. In all mechanical rooms, provide charts showing number and locations of all valves, type of service, etc. Frame with aluminum, under glass.

B. In existing buildings include existing valves in the charts of new valves.

3.11 WARRANTY AND INSTRUCTIONS:

A. See General Conditions - One-Year Warranty.

B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one (1) year after date of substantial completion of the Contract. Should any defects in materials, workmanship, or equipment be made know to Contractor within the one (1) year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.

C. After completion of the work, Contractor shall operate the equipment which he installs for a period of ten (10) working days, as a test of satisfactory operating conditions.

During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment. Furnish necessary oral and written operating instructions to the Owner's representative.

D. Provide three (3) sets of manufacturer's operating and maintenance manuals and parts lists including nearest manufacturer's sales and service representative by name, address and phone for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency there of. Include all warranty dates on equipment and guarantees. Include names, address and phone of any subcontractor and work performed. Bind above items in loose leaf three (3) ring binders with tab for each class of equipment.

E. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.

F. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.

3.12 PROJECT CLOSE-OUT DOCUMENTS:

A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:

1. Record drawings – Plumbing (reproducible). Electronic drawings dwg format and pdf format.

2. Equipment and Fixture Submittal Data: List of manufacturers representative including name,

3. address and telephone number that supplied requirement (3).

4. Equipment operating and maintenance manuals including: Spare parts required (3).

5. Maintenance schedule (3).

6. Equipment warranty dates and guarantees (3).

7. List of Owner's Personnel who have received maintenance instructions.

8. Record of inspections indicating what system was tested, type of tests, date of tests and

9. those parties witnessing tests.

10. Valve Tag Chart.

END OF SECTION

1.0 - GENERAL:

1.1 SCOPE:

A. Provisions of this section apply to all Plumbing work.

B. Include Section 15410, "GENERAL PROVISIONS - PLUMBING", with this Section.

C. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 48 hour notice is required prior to performance of test.

2.0 - PRODUCTS:

2.1 NOT APPLICABLE

3.0 - EXECUTION:

3.1 GENERAL REQUIREMENTS:

A. After system have been installed, Test, Balance and Adjust System for proper operation, flow rates, pressures and temperatures. Correct any noise and/or vibration conditions.

B. Perform all tests as required by local codes. Contractor shall furnish testing equipment. Keep a record of all tests indicating dates of tests, those persons witnessing tests and results of tests.

C. Provide with the Close-Out Documents a Testing Record.

D. If local Codes are more stringent, local Codes shall govern.

3.2 SANITARY SYSTEMS:

A. Test piping by stopping lower outlets and filling with water to 10' hydrostatic head. Stop leaks and repeat test until watertight. All joints shall be exposed throughout test.

B. Provide "Ball Test" on all piping 3" and larger with ball 1/2" smaller than pipe diameter.

C. Provide visual inspection of all building drain piping below grade. Visual inspection shall be by means of a video camera routed through the drain system. Where the drain piping is connected to existing drain piping, the visual inspection shall include the existing drain piping from the point of connection, downstream to the point of connection to the public utility. A video tape and written report, noting any defects, on the findings of the visual inspection shall be provided to the owner with the close-out documents. The Plumbing Contractor shall provide personnel and equipment required for the visual inspection.

3.3 DOMESTIC WATER PIPING:

A. On completion of roughing-in, cap all outlets, make connections with house supply line, and put under full water pressure. Test by applying additional pressure (by temporary pump or compressed air connection) to total hydrostatic pressure 1-1/2 times street pressure but not less than 150 psig for not less than 4 hours.

B. Immediately and completely stop all leaks and retest until system is watertight. After

testing, leave general pressure on until ready to install fixture (except when necessary to drain to avoid freezing during construction). After completion of all tests, repairs and installation of fixtures, flush all domestic hot and cold water piping with water to remove all sediment scale and until water runs clear, then disinfect.

C. Disinfect piping with hypochlorite solution of chlorine or compressed chlorine gas applied through on approved chlorinator. Operate all valves and faucets several times to insure the chlorine reaches all parts of the system. Feed water and chlorination agent into the system at rates that will provide a residual chlorine content of not less than 50 ppm after a retention period of 6 hours and 10 ppm after a retention period of 24 hours. Upon completion of treatment, flush treated water from each system until the water supply is satisfactory to the public health authority having jurisdiction. Provide Architect a certificate of compliance from the local Health Department.

D. Clean air aerators, hose sprays, flush valves, etc. and adjust to proper flow rates.

3.4 COMPLETION OF TEST:

A. Upon completion of all testing, Contractor shall provide to the Architect copies of test results and include a listing of all personnel witness to the tests.

END OF SECTION

1.0 - GENERAL:

1.1 SCOPE:

A. Include Section 15410, "GENERAL PROVISIONS - PLUMBING", with this Section.

2.0 - PRODUCTS:

2.1 MATERIALS:

A. Pipe and fittings to be the same manufacturer.

2.2 SANITARY – WASTE AND VENT PIPING:

A. Soil, waste and vent piping: PVC Plastic.

B. PVC plastic pipe: PVC-DWV, ASTM D-2665.

C. Joints for PVC plastic pipe: Solvent welded, ASTM B-2564.

D. Install vent stacks through roof. Terminate 12" above finish roof. Flashing is specified under Roofing Section.

E. Connect to site sanitary 5'-0" from Building. Verify with Civil Site Drawings exact size, location, and invert of site sewer prior to beginning work.

2.3 DOMESTIC WATER PIPING:

A. Domestic Water Piping: Copper tube.

B. Copper Tube: ASTM C-88, copper water tube, Type "L" hard temper inside building, Type "K" outside building and below slab on grade. Fittings, cast brass or wrought copper water tube fittings, ANSI B-16.18 or B-16.22.

C. Joints on copper tube:

1. Inside Building: Properly cleaned fluxed and soldered as recommended by manufacturer, using 95-5 solder and 100% lead free flux.

2. Outside Building and below slab on grade: "Sil-Fos".

D. Provide temporary construction water at site as required.

E. Connect to water service 5'-0" from building, provided and installed under Civil Section. Verify exact location with Civil Drawings.

F. All water piping installed below slab on grade to be type "K" soft copper bent up on both ends with no joints below slab.

2.4 VALVES:

A. Domestic Water Piping Valves:

1. Ball Valves: All bronze, 150 psig WP, chrome plated bar stock ball, full port Teflon seats, stem packing seal and thrust washer, Watts B-6080 or B-6081, Apollo 20-100, Red White 5044F or 5094F, Kitz 56 or 57. Provide valve handle extension to (minimum 1") clear insulation.

2. Check valves 2" and smaller: All bronze, 125 psig WP, bronze disc, swing check, Stockham B-309, Crane 1342, Nibco S-413-B, Milwaukee 1509, Red White 237, Kitz 14.

3. Check valves 2-1/2" and larger: Iron body, bronze trim, switch check, 125 psig WP, Stockham G-931, Crane 373, Nibco F-918-B, Milwaukee F2974, Red White 435, Kitz 78.

B. Water pressure reducing valves: Watts, Wilkins, or Cash Acme, complete with inlet strainer, unions, inlet and outlet pressure gages and shut-off valve up stream of strainer.

2.5 PIPE HANGERS:

A. General: Pipe hangers, Grinnell, PHD, Michigan Hanger, or Elcen. Grinnell figure numbers are given for reference. Provide copper clad hangers on bare copper lines.

B. Pipe hangers for lines 3" and smaller, adjustable wrought ring hangers, Grinnell Fig. 97 or wrought clevis hangers, Grinnell Fig. 260.

C. Pipe hangers for lines 4" and larger, adjustable wrought clevis hangers, Grinnell Fig. 260.

D. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.

E. Provide riser clamps on pipe risers on each floor. Clamps in contact with copper or plastic pipe, plastic coated.

F. Beam Clamps: Grinnell Fig. 229.

G. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Grinnell Fig. 282.

H. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (power driven anchors are not acceptable).

I. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8" and 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.

J. Space pipe hangers at maximum: 5' intervals for cast iron pipe with additional hanger at each fittings. Pipe hanger spacing for screwed, solder joint and welded piping: 1/2", 6 ft.; 3/4" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3", 12 ft.; 4" to 6", 14 ft.; 8" and over, 16 ft. Polypropylene and PVC plastic pipe 4 ft. horizontally maximum or as directed by manufacturer if closer, and 10 ft. vertically. Install additional hangers at change of direction and valve clusters.

K. Install pipe hangers on insulated pipe over pipe covering. Provide sheet metal saddle under hanger length to be 1-1/2 times the pipe diameter, minimum 12" long.

L. On sanitary piping requiring insulation, hanger may be installed directly on pipe and insulation installed over hanger.

3.0 - EXECUTION:

3.1 PIPE INSTALLATION:

A. All piping shall be securely anchored in place to the Building Structure.

B. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.

C. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractor's National Association or other approved procedure conforming to the requirements of ANSI B-31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxactylene welding. Provide full perimeter wells at both face end and collar end of each slip-on flange.

D. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid spring of pipes during assembly.

E. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.

F. Make pipe size reductions using reducing fittings. Bushings are prohibited.

G. Install 3/4" ball or gate valve drains with hose adapters at low points of water piping and at bases of all risers or where shown provide large drains.

H. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment.

I. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulation unions or couplings, equal to EPCO.

J. Run piping concealed, except where specifically shown or specified exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.

K. Lay underground pressure piping so top of pipe is at least 18" below finished grade. Provide deeper bury if required by local regulations. Support all underground piping solidly along body of pipe. Strongly suspend other piping from building construction.

L. Run no piping or tubing in direct contact with slag fill. Where necessary to pass through slag, protect piping with not less than two (2) wrappings of polyvinyl chloride tape or equivalent protection approved by Architect.

M. Install shock arrestors as manufactured by J. R. Smith, Josam, Zurn or Wade as required by the IPC Plumbing Code and where indicated on drawings. Size in accordance with manufacturer requirements.

3.2 INSTALLATION OF VALVES:

A. Provide shut-off valves where shown and detailed on Drawings. Locate valves to isolate each item to facilitate maintenance and/or removal.

B. Locate valves in piping connections to water heaters, etc., so heads and tube bundles can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to heat exchangers.

C. Provide sweat to screw adapters where required.

D. In Buildings with water pressure exceeding 80 psig, provide and install a water pressure reducing valve(s) immediately upon entering building or as shown on Drawings. The P.R.V. shall be line size and have an integral strainer or separate WYE strainer up stream of P.R.V. Provide a ball or gate valve immediately upstream of P.R.V. and strainer.

END OF SECTION

1.0 - GENERAL:

1.1 SCOPE:

A. Include Section 15410 "GENERAL PROVISIONS - PLUMBING", with this Section.

B. Repair existing insulation at points of connection to existing work.

C. "Exposed" is defined as: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".

D. Insulate all items subject to sweating or loss of heat.

E. All insulation shall be installed by licensed applicator and applied in accordance with the Manufacturer's Recommendations.

1.2 INSULATION REQUIREMENTS:

A. Comply with NFPA 90A.

B. Pipe hanger saddles are specified in Section 15450 "MATERIALS AND METHODS - PLUMBING"

C. Use insulation and adhesives with Underwriter's Laboratories flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:

1. 50 for pipe covering located in air ducts, plenum or casing.

2. 150 for all other pipe, and equipment insulation.

2.0 - PRODUCTS:

2.1 FIBERGLASS PIPE COVERING:

A. Snap-on glass fiber insulation minimum density 5#/cu. ft. maximum thermal conductivity at 75°F mean temperature 0.25 BTU/(hr) (sq. ft.) (°F/in.) with UL rated vinyl coated and embossed vapor barrier laminate of aluminum foil and kraft reinforced with glass fiber yarns (ASJ).

B. For all lines seal jacket with self sealing lap and staple with outward clinching staples 3" o.c. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.

C. Cover fittings to thickness of adjacent covering with factory pre-molded fitting covers. Cover flanged valve bodies with flanged unions. Do not cover screwed unions on hot lines. Finish fittings with a skim-coat of insulating cement and when cement is dry fitting shall be covered with glass fab and vinyl acrylic mastic. Finish fittings exposed in equipment rooms, boiler room, and in finished spaces with vinyl acrylic mastic over glass fab.

D. At Contractor's option, concealed tees may be insulated with field fabricated tee covers consisting of straight pipe covering on run of tee with notch at branch together with pipe covering on branch contoured to fit notch. Glass fab shall be applied around main, lapping contoured joint at branch by 1" minimum for the full circumference of joint.

Cover entire fitting covering with vinyl- acrylic mastic over glass fab, 1/8" thick (dry) coat. Submit sample of fabricated tee covering to Architect for approval before work is begun.

2.2 MANUFACTURERS

A. Acceptable Manufactures for Fiberglass Insulation Materials:

1. Owens-Corning.

2. Certaniteed.

3. Knauf.

4. Manville Corporation

B. Acceptable Manufacturers for Foamed Plastic Closed Cell Elastometric Insulation Materials:

1. Armstrong AP.

2. Rubatex.

C. Acceptable Manufacturers for Adhesives, Mastics and Coatings:

1. Armstrong.

2. Benjamin Foster.

3. Childers.

4. Marathon.

D. Acceptable Manufacturers for Metal Jackets:

1. Childers.

2. Manville Metal-Loc.

2.3 SCHEDULES - PIPING

A. Plumbing Piping:

1. Domestic Cold Water Interior, Above Grade:

a. Glass Fiber Pipe Insulation

i. All pipe sizes: 1 inch thick.

ii. Pipes located in walls: ½ inch thick.

b. Foamed Plastic Pipe Insulation

i. All pipe sizes: 1 inch thick.

ii. Pipes located in walls: ½ inch thick.

2. Domestic Hot and Recirculating Water Interior, Above Grade:

a. Glass Fiber Pipe Insulation

i. All pipe sizes: 1-1/2 inch thick.

ii. Pipe located in walls: 1 inch thick.

b. Foamed Plastic Pipe Insulation

i. All pipe sizes: 1 inch thick.

ii. Pipes located in walls: ½ inch thick.

3. Floor Drain Bodies, Traps and Waste Piping Between Floor Drain and Waste Stack for Floor Drains Serving Refrigeration Equipment, Ice Machine and AC Units; Interior, Above Grade:

a. Glass Fiber Pipe Insulation

i. All pipe sizes: 1 inch thick.

2.4 INSTALLATION – EQUIPMENT INSULATION GENERAL

A. Install in accordance with NAIMA Insulation Standards.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires or bands.

E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

G. Finish insulation at supports, protrusions, and interruptions.

H. Equipment in Mechanical Rooms or Finished Spaces: Finish with canvas jacket or as scheduled.

I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

K. Install in accordance with NAIMA National Insulation Standards.

L. Exposed Piping: Locate insulation and cover seams in least visible locations.

M. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

N. Fit pipe hangers over insulation.

O. Inserts and Shields:

1. Application: Protect insulated piping at hangers and supports with insulation shield. On pipe sizes over 2 inches, provide insert.

2. Insulation Protection Shield: Galvanized steel formed in half circle to fit insulation. Length and gauge as follows:

   a. Up to NPS 4: 12 inches long and 22 gauge.

   b. NPS 6: 18 inches long and 22 gauge.

   c. NPS 8 through 12: 24 inches long and 18 gauge.

   d. NPS 14 and Large: 24 inches long and 16 gauge.

3. Insulation-Insert Material: Water repellent treated, ASTM C533, Type I calcium silicate; or ASTM C552, Type II cellular glass of same thickness and vapor barrier jacket specified for surrounding insulation. Insert shall be a minimum of 2 inches longer than the shield.

4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

5. For Clevis Hangers: Insert shall cover lower 180 degrees of pipe.

6. Option: At Contractor's option, insert may be factory fabricated Thermal Hanger Shield (insulation insert encased in sheet metal shield) equal to Pipe Shield, Inc. "Insulated Pipe Supports."

P. Continue insulation through metal studs, walls, sleeves, pipe hangers, and other pipe penetrations. Finish firestopping at supports, protrusions, and interruptions. At fire separations, refer to Division 7 and Section 15410: Sleeves.

Q. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.0 - EXECUTION:

3.1 PLUMBING PIPING INSULATION:

A. Cold water piping, interior, above grade: "Fiberglass Pipe Covering", 1" thick. Pipe insulation in partitions and chases may be 1/2" thick "Arma-cell" or approved equal.

B. Hot and Hot Water Return water piping, interior, above grade: "Fiberglass Pipe Covering", 1" thickness. Pipe insulation in partitions and chases may be 1/2" thick "Arma-cell" or approved equal.

C. All horizontal storm piping and roof/overflow drain bodies: "Fiberglass Pipe Covering", 1" thick.

D. Exposed P-Traps, stops and supplies on handicapped lavatories, and sinks. Equal to "PRO-WRAP" by McGuire.

END OF SECTION

1.0 - GENERAL:

1.1 SCOPE:

A. Include Section 15410, "GENERAL PROVISIONS - PLUMBING ", with this Section.

B. Pay particular attention to requirements in the General Provisions for substitution of products not named or listed as substitutions.

2.0 - PRODUCTS:

2.1 CLEANOUTS:

A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angle, upper terminals and not over 50 feet apart on straight runs. All cleanouts to have bronze countersunk tapered slotted plugs, except acid waste piping cleanouts, which shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, piping larger than 6" shall have minimum 6" cleanout covers.

B. Exposed Cleanouts: Cast brass plug type, J.R. Smith #4470.

C. Wall type cleanout plug and access covers, J.R. Smith #4472. Cleanout plug must be within 1" of finish wall and must be tapped for access cover.

D. Install wall cleanouts on stacks at flush valve fixtures 12" above top of flush value, 12" above finish floor on sinks, lavatories and water coolers and 12" above grab bars at fixtures with grab bars. Locate cleanouts to clear baseboard at floor.

E. Floor type cleanout access covers: J.R. Smith #4248-NB. Plug must be within 3" of finished floor. Grout cleanout below access cover to seal watertight.

F. Outside Cleanouts: J.R. Smith #4258 cleanout access encased in a 18" X 18" X 6" deep concrete pad. See Detail on Drawings.

2.2 REDUCED PRESSURE ZONE BACKFLOW PREVENTER AND DOUBLE CHECK VALVE ASSEMBLIES:

A. One (1) inch and larger: Equal to Watts #909 with gate valves and inlet strainer. Provide additional valve upstream of strainer. Clayton, Beeco, Febco, Conbraco, Wilkins or equal. Provide same size as piping.

B. One-half (1/2) inch and three-fourth (3/4) inch: Watts #9D, Wilkins #750, same size as pipe.

C. Pipe relief from backflow preventer full size to nearest floor drain. Provide factory made air gap for relief connection.

D. Double check valve assemblies: Watts, Clayton or Beeco.

2.3 PLUMBING FIXTURES AND EQUIPMENT:

A. All "wetted" domestic potable fixtures, piping materials, valves shall meet the Federal Lead Free Guidelines. All materials shall be clearly marked and submitted with complete data during submittal review.

B. Unless otherwise specified, all fixtures complete as catalogued, commercial grade, white color, exposed metal trim chromium plated.

C. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lug bolts in all holes as recommended by the manufacturer.

D. Flush valve "YJ" supports shall be installed 1" below vacuum breaker on all water closet flush valves and around vacuum breaker on urinals.

E. Seal all fixtures at wall and floor with white silicone sealant. Seal countertop fixtures with clear silicone sealant.

F. Mount all fixtures at standard mounting height unless otherwise noted.

G. Furnish sinks and lavatories with correct number of drilling required by the faucet and accessories. Cock hole covers are not acceptable.

H. All items complete as catalogued as shown on drawings:

2.4 SUBSTITUTE MANUFACTURERS:

A. Where Kohler is listed above, American Standard, or Zurn may be substituted.

B. Where J.R. Smith is listed above, Josam, Zurn or Wade may be substituted.

C. Where Elkay water coolers are mentioned above, Oasis may be substituted, only if water ways are constructed of totally lead free materials.

D. Where McGuire is listed above for traps, outlets and stops, EBC or American Standard may be substituted.

E. Where Symmons is listed above, Chicago Faucet or Zurn may substituted.

F. Where Chicago Faucet is listed, T&S Brass may be substituted.

G. Where Elkay sink (s) are listed above, Just may be substituted.

H. Where Church is listed above, Bemis, Beneke or Centoco may be substituted.

I. Where Lochinvar tank type water heaters are listed, A.O. Smith or Rheem may be substituted.

J. Where Stern Williams is listed above, Fiat may be substituted.

K. Where Sloan is listed, Zurn may be substituted.

L. Where Armstrong is listed above, the equal of B & G, Taco, Grundfos or Thrush may be substituted.

3.0 - EXECUTION:

3.1 INSTALLATION:

A. Equipment shall be installed in accordance with manufacturer's recommendation.

B. See details for mounting instruction and accessories.

C. Install electric water heaters so elements can be removed without disconnecting and/or removing heater.

D. Cleanouts on water closet stacks shall be installed minimum 12" above top of the flush valve on standard water closets, minimum 12" above top of grab bar on handicapped water closets and minimum 12" above tope of tanks on non-handicapped tank type water closets. On urinal locate cleanouts minimum 12" above top of flush valve on handicapped urinals and 12" above finish floor on standard units. On lavatories and sinks - 12" above finish floor and all other fixtures 12" above floor or above top of fixture.

E. Stops and supplies are to be installed with chrome plated brass nipples penetrating wall with deep escutcheon at wall. Compression type stops are not acceptable.

F. All floor mounted fixtures supports are to be securely attached to the floor using anchors in all mounting hole of size as recommended by manufacturer.

G. Provide wood backing in wall at all flush valve brackets and faucet supports and anchor brackets and supports to wood backing with anchors of sufficient length to penetrate backing.

H. Handicapped flush valve shall be installed with the pull handle on the open side or side opposite the adjacent wall.

END OF SECTION

TABLE OF CONTENTS - ELECTRICAL - SECTION 16000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The "General Conditions" and "Special Conditions" of Contract as written and referred to hereinbefore are adopted and made part of Division 16.

1.2 DESCRIPTION OF WORK:

A. Provide equipment, labor, etc., required to install complete working electrical system as shown and specified.

B. Provide fixed electrical equipment, except where specifically noted otherwise.

C. Provide portable electrical equipment for complete system.

D. Provide equipment and/or wiring normally furnished or required for complete electrical systems but not specifically specified on the drawings or in specifications, as though specified by both.

E. All equipment and wiring shall be new.

F. Electrical work includes, but is not limited to:

1. Arrange with local utility companies for services as shown or specified.

2. Removal or relocation of electrical services located on or crossing through project property, above or below grade, obstructing construction of project or conflicting with completed project or any applicable code.

3. Complete 600 volt Distribution System. Provide meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, and/or other equipment forming part of system.

4. Connection of all appliances and equipment.

5. Complete raceway system for fire alarm. Complete fire alarm system. Provide an allowance for a complete fire alarm system.

6. Complete emergency lighting and power system, including individual battery units and inverters.

7. Complete raceway system(s) for auxiliary system(s) as shown. Complete auxiliary systems shown. Provide an allowance for auxiliary systems.

8. Complete interior and exterior lighting.

9. Provide temporary facilities for construction power.

10. Complete raceway system(s) for voice data system(s) as shown. Complete voice data systems shown.

1.3 WORK NOT INCLUDED:

A. Furring for conduit and equipment.

B. Finish painting of conduit and equipment.

C. Installation of motors except where specifically noted.

D. Control wiring for mechanical systems, except where indicated to be provided by Electrical Contractor.

E. Installation of telephone instruments and wiring.

F. Flashing of conduits into roofs and outside walls. Inform General Contractor of number and size of roof penetrations prior to bidding.

1.4 RELATED WORK SPECIFIED ELSEWHERE:

A. Classification of excavation: Architectural Division.

B. Painting: Painting Division.

C. Concrete Work: Concrete Division.

1.5 REQUIREMENTS OF REGULATORY AGENCIES:

A. Obtain and pay for all permits required for the work. Comply with all ordinances pertaining to work described herein.

B. Install work under this Division per drawings, specifications, latest edition of the National Electrical Code, Local Building Codes, and any special codes having jurisdiction over specific portions within complete installation. In event of conflict, install work per most stringent code requirements determined by Architect.

C. Arrange, pay fees for and complete work to pass required tests by agencies having authority over work. Deliver to Architect Certificates of Inspection and approval issued by authorities.

1.6 QUALIFICATIONS OF CONTRACTOR:

A. Has completed minimum two projects same size and scope in past five (5) years.

B. This qualification applies to Sub-Contractors.

C. Use workmen experienced in their respective trade. Submit qualifications of Superintendent for review.

D. Owner reserves right to reject bid of any Contractor failing to meet these qualifications.

1.7 GENERAL JOB REQUIREMENTS:

A. Drawings and Specifications:

1. Electrical work is shown on "E" series drawings inclusive. Follow any supplementary drawings as though listed above.

2. Drawings and specifications are complementary. Work called for by one is binding as if called for by both.

3. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices, and routing of conduits to a reasonable extent, without extra cost to Owner.

4. Refer conflicts between drawings and specifications describing electrical work and work under other Divisions to Architect for remedial action.

5. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.

6. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized.

7. Charges for extra work not allowed unless work authorized by written order from Architect approving charge for work.

B. Visit to Site:

1. Visit site to survey existing conditions affecting work. Include necessary materials and labor to accomplish the electrical work, including relocation of existing services and utilities on building site in bid. No consideration given to future claims due to existing conditions.

C. Definitions:

1.	Provide:	Furnish, install and connect complete.
2.	Wire:	Furnish all necessary wiring and connect complete.
3.	Install:	Set in place and wire complete.
4.	Work:	Materials completely installed and connected.
5.	AWG:	American Wire Gage.
6.	NEC:	National Electrical Code (latest edition)
7.	NFPA:	National Fire Protection Association.
8.	OSHA:	Occupation Safety and Health Administration.
9.	UL:	Underwriters Laboratories, Inc.
10.	NEMA:	National Electrical Manufacturers Association.
11.	IEEE:	Institute of Electrical and Electronic Engineers.

D. Workmanship, Guarantee and Approval:

1. Work under this Division shall be first class with emphasis on neatness and workmanship.

2. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation subject to Architect's constant observation, final approval, and acceptance. Architect may reject unsuitable work.

3. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Division is proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.

4. In event that project is occupied or systems placed in operation in several phases at Owner's request, guarantee will begin on date each system or item of equipment is accepted by Owner.

E. Observations of Work and Demonstration of Operation:

1. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.

2. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner.

F. Testing of Electrical Systems:

1. Test Completed work as follows:

a. Perform test required by Architect to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.

b. Insulation - use 1000 VDC insulation tester (0-500 megohm full-scale), equal to "Megger" as manufactured by Biddle Company. Test conductors and busses of all systems, including feeders, main service busway, branches, motors, devices, equipment, etc. Test branches for one (1) minute; test feeders, bus ducts, busses, etc., for 15 minutes with readings at one minute intervals.

c. Receptacles:

(1) Use Woodhead Ground Loop Impedance Tester. Test each receptacle. Record readings.

2. Ground Testing:

a. Testing of Made Ground Electrodes:

(1) Test Ground Systems Indicated.

(2) Using a measuring device which generates minimum of 500 VDC, calibrated in ohms (maximum 200 ohm scale) J.C. Biddle "Vibrotester" or approved equivalent.

(3) Provide test electrode in accordance with Measuring Device Manufacturer's instructions. Use ground rods as specified in Section "Grounding".

(4) Follow instructions of measuring device manufacturer for proper results.

(5) Test grounds only when earth is dry.

(6) Record ambient temperature, date, time, approximate water table level (as obtained from local geologists); type of earth material.

3. Test interval - 15 minutes. Graph microampere leakage vs. time with values plotted each 30-60 seconds. Test to be discontinued if erratic results are observed. Test records include date, ambient temperature, relative humidity, and time of day.

4. Record all test results in loose leaf log for Owner. Test information required: Date of test; name of circuit or equipment; ambient temperature; weather conditions; final instrument readings; graph of readings for 15 minutes tests. Provide three copies of log.

5. Architect will observe tests. One week prior notice required.

G. Materials and Substitutions:

1. All material shall be new, with U.L. label where available. If U.L. label is not available, material shall be manufactured in accordance with applicable NEMA; IEEE and Federal Standards.

2. No material shall be substituted for specified, except by prior written approval of Architect. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material given consideration only if adequate comparison data including samples are provided. Approval required prior to bid date. Bid substituted material only if approved in writing by Architect.

3. Submit to Architect within 30 days after award of contract a complete list of proposed material manufacturers. List does not preclude submission of shop drawings. Approval of manufacturer on list does not constitute approval of specific material or equipment.

H. Shop and Erection Drawings:

1. Submit complete shop drawings for all material and equipment furnished under Division 16 of specifications, to Architect for review within (30) days after award of contract. Shop drawings shall be submitted on timely basis to allow adequate lead time for review, re-submission if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Architect/Contractor. Include complete descriptive data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Architect. Shop drawings and submittals shall bear the stamp of approval of the Electrical and General Contractor as evidence drawings have been checked by them. Drawing submitted without this stamp of approval will not be considered

and will be returned for proper resubmission.

2. Drawings larger than 8-1/2" x 11", submit 3 copies and 1 reproducible of each drawing. Architect will retain 2 copies and return 1 reproducible and 1 copy to Contractor. Contractor is responsible for copying reproducible for distribution.

3. 8-1/2" x 11" drawing in brochure: Submit 6 original copies for review Architect will retain 2 copies and return 4 copies to Contractor.

4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor is responsible for dimensions and sizes of equipment. Inform Architect in writing of equipment differing from that shown.

5. Prepare erection drawings when required by Architect. Investigate thoroughly all conditions affecting work and indicate on drawing. Architect will review erection drawings before work commences.

6. Provide for Owner one (1) set of final shop and erection drawings, except provide 1 set of 1.5 mil Mylar sepias of shop drawings larger than 8-1/2" x 11" size.

7. Coordination shop drawings will be required for the following areas, drawn to a scale of not smaller than 1/4" - 1'-0":

   a. Electrical equipment rooms and areas.

   b. Electrical and mechanical equipment areas.

   c. Start drawings as HVAC shop drawings indicating all ductwork piping, equipment and locations of mechanical room floor drains, and electrical connections. Indicate elevations of all ductwork and piping. Draw sections as required to clarify congested situations.

   d. Next, the Plumbing Section shall add all piping and plumbing equipment to the drawings.

   e. Next, the Fire Protection Section shall add all sprinkler heads and fire protection piping.

   f. Next, the Electrical Sections shall add all electrical fixtures, conduit and equipment.

   g. Next, the drawings shall be submitted to the General Contractor for final coordination.

   h. Finally, after the General Contractor has approved the drawings they shall be submitted to the Architect for approval.

I. Cooperation:

1. Carefully coordinate work with other contractors. Refer conflicts between trades to Architect.

2. Work to be installed as progress of project will allow. Schedule of work determined by General Contractor and/or Architect.

J. Maintenance and Operating Instructions for Equipment:

1. Submit to Architect one (1) set of data prepared by manufacturer for each item of electrical equipment completely describing equipment. Data to include parts lists, description of operation, shop drawings, wiring diagrams, maintenance procedures and other literature required for maintenance of equipment. Bind in booklet form for presentation.

K. "Record" Blue Line Prints:

1. Provide "Record" blue line prints at the completion of job. Keep set of prints on job and record day to day changes to Contract drawings with red pencil. One complete set of blue line prints will be furnished Contractor for record drawings. Indicate actual location of conduit systems, outlets, and equipment. Turn over prints to Architect at final observation.

2. After receipt of "Record" prints, Architect will correct original tracings. Contractor shall make (and pay for) auto-positive reproductions of all floor plans and riser diagram. Reduce 1/4" scale drawings to 1/2 size; 1/8" scale drawings to be full size; reduce Riser Diagram to 1/2 size.

3. Frame "Record" auto-positives under glass in extruded aluminum frame and mount with screws and inserts on wall. Mount Riser Diagram near Main Switchboard; Mount Floor Plans near panelboard involved. Where more than one panelboard is involved and are separated, provide framed autopositive near each panelboard.

Items for Owner:

4. Provide following items for Owner at time of substantial completion:

a. Certificates of inspection and approval from authorities having jurisdiction.

b. Written guarantees.

c. "Record" blue line prints.

d. Final approved shop drawings (1 set).

e. Spare fuses (furnish receipt).

f. Maintenance data (1 set).

g. Affidavit of Owner Instruction (1 copy).

L. Marking:

1. Identify each starter, (including starters furnished under Mechanical Section), panelboard, cabinet, control device, breaker, disconnect and safety switch with 1/4" high black letters cut in a white laminated phenolic strip. Use red letters for all equipment connected to emergency system. Attach to enclosure with two (2) metal screws.

2. Identify receptacle outlets in critical care areas with nameplates indicating circuit number and panel designation. Critical care areas include: Operating Rooms,

Delivery Rooms, Intensive Care Units, Special Procedures Rooms, Emergency Trauma and Treatment Rooms. Plates shall be engraved with black fill. Outlets for emergency shall be similarly engraved in red.

3. Nameplates required for other items in this Division similar to those described above.

M. Protection and Storage:

1. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury.
2. Do not leave exposed or unprotected, electrical items carrying current. Protect personnel from exposure to contact with electricity.

3. Protect work and materials from damage by weather, entrance of water or dirt. Cap conduit during installation.

4. Avoid damage to materials and equipment in place. Repair, or remove and replace damaged work and materials.

5. Exercise particular care when working around telephone (electronic) equipment to prevent entrance of dust, moisture and debris into the equipment. Provide dust barriers and partitions as required.

6. Deliver equipment and materials to job site in original, unopened, labeled container. Store to prevent damage and injury. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters. Storage space on site and in building designated by Owner/Architect.

7. Install equipment per manufacturer's recommendations. Conflicts between contract documents and these recommendations, deferred to Architect.

N. Excavation and Backfill:

1. Excavate for work in this Division.

2. Avoid existing facilities in excavating. Contractor is responsible for repair and replacement of damaged facilities in executing work.

3. Backfill in twelve inch (12") lifts, wetted down and tamped. Compaction minimum 95% of adjacent earth.

4. Repairing to be comparable to work cut including new asphalt paving, concrete paving, sod, replanting shrubbery, etc. Architect will observe repair work, and reject unsuitable work.

O. Cutting and Repairing:

1. Cut and repair walls, floors, roof, etc., required to install work. Where work cut is finished, employ original installer of finish to repair finish. Do not cut structural members.

P. Anchors:

1. Provide anchors for all equipment, raceways, hangers, etc. to safely support

weight of item involved. Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable. Protect telephone equipment from drilling residue.

Q. Cleaning and Painting:

1. Clean equipment furnished in this Division after completion of work.

2. Touch-up or re-paint damaged painted finishes.

3. Remove debris, packing cartons, scrap, etc., from site.

R. Starters:

1. Separately mounted starters are furnished under another Division, but installed in Division 16 unless specifically noted otherwise.

S. Control Wiring:

1. Control Wiring including low voltage and line voltage interlock wiring will be furnished and installed under another Division, except where specifically shown otherwise. Carefully coordinate power and control wiring interface.

T. Code Compliance:

1. Entire electrical installation shall comply with all aspects of code including local interpretations. This includes but is not limited to:

   a. Installation adjustment to meet all code clearances between electrical such as ductwork, other HVAC, plumbing, fire protection, and structural systems.

   b. Locations for items such as fire alarm appliances, exit lights, egress lighting, disconnect switches, etc.

2. No additional compensation will be allowed for code compliance. Notify engineer of difficulty encountered for assistance.

END OF SECTION 16010

PART 1 - GENERAL

1.1 DESCRIPTION OF SUBMITTAL CATEGORIES:

A. Submittals required are defined below and specified in each section. Refer to Section 01300.

B. Shop Drawings include fabrication, layout, wiring diagrams, erection, setting, coordination, similar drawings and diagrams and performance data.

C. Samples are units of work, materials or equipment items, showing the workmanship, pattern, trim and similar qualities proposed.

D. Manufacturer's Data is standard printed product information concerning the standard portions of the manufacturer's products.

E. Certifications are written statements, executed specifically for the project application by an authorized officer of the contracting firm, manufacturer or other firm as designated, certifying to compliance with the specified requirements.

F. Test Reports are specific reports prepared by independent testing laboratories, showing the results of specified testing. Industry Standards are printed copies of the current standards in the industry.

G. Manufacturer's Product Warranties are manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed by the manufacturer if the product fails under certain conditions and times limits.

H. Operating Instructions are the written instructions by the manufacturer, fabricator or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation, control and shut-down.

I. Maintenance Manuals are the compiled information provided for the Owner's maintenance of each system of operating equipment. Maintenance Materials are extra stock of parts or materials for the Owner's initial use in maintaining the equipment and systems in operation.

J. Guarantees are signed commitments to the Owner that certain acts of restitution will be performed if certain portions of work fail within certain conditions and time limits.

K. Product Data includes manufacturer's data pertaining to the products, materials and equipment of the work.

1.2 SUBMITTAL FORM AND PROCEDURES:

A. Submittals shall be made within 30 days of contract signing for projects of 12 months construction time or less. Make within 60 days for longer then 12 months construction time.

B. Submit shop drawings for all material and equipment furnished under Division 16 to Architect. Refer to Section 01300 get from Architect for submittal procedures.

C. Multiple System Items: Where a required submittal relates to an operational item of

equipment used in more than one system, increase the number of copies as necessary to complete maintenance manuals for each system.

D. Response to Submittals: Submittals will be returned with indication that documents comply with specifications or that documents do not comply and what action must be taken to be in compliance.

E. Coordinate electrical submittals through Contractor to Architect and assist Contractor in preparation of submittal.

F. Submittals shall bear the stamp and signature of electrical and general contractor. Failure to place same on drawings require resubmittal before review.

1.3 SPECIFIC SUBMITTAL REQUIREMENTS:

A. Shop Drawings:

1. To accurate scale except where diagrammatic representations are specifically indicated.

2. To show clearance dimensions of critical locations and show dimensions of spaces required for operation and maintenance of equipment.

3. To show conduit and conductor connections and other service connections.

4. To show interfaces with other work including structural support.

5. To include complete descriptive data, with dimensions, operating data and weight.

6. To indicate deviation from the contract documents.

7. To explain deviations.

8. To show how deviations coordinate with portions of the work, currently or previously submitted.

B. Review of shop drawings shall not relieve Contractor of responsibility for errors or omissions in shop drawings. Any equipment which will not fit into space shown on drawings shall be called to the attention of the Architect in writing.

C. Samples: Architect's review of sample submittals:

1. Limited to general type, pattern and finish.

2. Not to include testing and inspection of the submitted samples.

3. Compliance with specified requirements is exclusive responsibility of the Contractor.

D. Manufacturer's Data:

1. Where pre-printed data covers more than one distinct item, mark copy to indicate which item is to be provided.

2. Delete portions of data not applicable.

3. Mark data showing portion of operating range required for project application.

4. Elaboration of standard data describing a non-standard product processed as a shop drawing.

E. For each product include:

1. Manufacturer's production specifications.

2. Installation or fabrication instructions.

3. Source of supply.

4. Sizes, weights, speeds and operating capacities.

5. Conduit and wire connection sizes and locations.

6. Statements of compliance with required standard and governing regulations.

7. Performance data, where applicable.

8. Other information needed to confirm compliance. Manufacturer's recommended parts list.

F. Certifications: Submit with notarized execution.

G. Test Reports: Submit notarized test reports signed and dated by firm performing test.

H. Manufacturer's Product Warranties: Where published warranty includes deviation from required warranty, product is disqualified from use on project, unless manufacturer issues a specific project warranty.

I. Operating Instructions submittal required:

1. Manufacturer's operating instructions for each item of electrical equipment.

2. Supplement with additional project application instructions where necessary.

3. Specific operating instructions for each electrical system which involves multiple items of equipment. Instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operations.

4. Typewritten in completely explained and easily understood English language.

J. Maintenance Manual Requirements:

1. Emergency instructions including addresses and telephone numbers for service sources.

2. Regular system maintenance procedures.

3. Proper use of tools and accessories.

4. Wiring and control diagram for each system.

5. Manufacturer's data for each operational item in each system.

6. Manufacturer's product warranties and guarantees relating to the system and equipment items in the system.

7. Shop drawings relating to the system.

8. Bind each maintenance manual in one or more vinyl-covered, 2", 3-ring binders, plus pocket-folders for folded drawings. Index with thumb tab for sections. Mark the back spine and front cover of each binder with system identification and volume number.

K. Maintenance Materials: Deliver to Owner in fully identified containers or packages suitable for storage.

L. Guarantees: Where indicated as "Certified", provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal. Submit draft of each guarantee prior to execution.

END OF SECTION 16012

SECTION 16014 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Systems and equipment requiring identification are shown on the drawings, and extent of identification is specified herein and in individual sections of work.

B. Types of electrical identification include:

1. Exposed conduit color marking.
2. Buried cable and conduit warnings.
3. Cable/conductor identification.
4. Operational instructions and warnings.
5. Danger signs.
6. Equipment/system identification signs (nameplates).

1.2 SUBMITTALS:

A. Manufacturer's Data:

1. Product specifications and installation instructions for each material and device.

B. Samples:

1. Provide for each color, lettering style and other graphic representation.

PART 2 - PRODUCTS

2.1 ELECTRICAL IDENTIFICATION MATERIAL:

A. Color-Coded Conduit Markers:

1. Color code all conduit with 3/4 inch wide band of vinyl plastic electrical tape, 3M Company "Scotch 35", applied two (2) full turns around conduit, 6" from all conduit terminations into switchboards, panelboards, motor control centers, starters, cabinets, control panels, pullboxes, outlet boxes, etc., on each side of walls, floors or roof penetrated by conduit and where conduit enters wall to outlets below.

CONDUIT COLOR CODE

SYSTEM	COLOR
120/208 Volts - Normal	Black
277/480 Volts - Normal	Yellow
120/208 Volts - Emergency	Black and Red
277/480 Volts - Emergency	Yellow and Red
Intercom/Paging/Music/Telephone/Dictation	Brown
Computer/Word Processing/Monitoring/Security	Blue
Fire Alarm	Orange

B. Where authority does not allow tape use paint acceptable to authority.

C. Underground Line Marker/ Warning tape:

1. Permanent colored, detectable plastic tape with foil core (color per AWPA

Standard for utility being identified), with continuous-printed legend; for direct-burial service; minimum 6" wide x 4 mils thick. Legend to indicate type service of cable (e.g. "WARNING: Buried Electric Line").

D. Cable/Conductor Identification Bands:

1. Manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers, wrap-around type; pre-numbered plastic coated, or write-on type with clear plastic self-adhesive cover flap, lettered to show circuit identification.

E. Self-Adhesive Plastic Signs:

1. Manufacturer's standard, self-adhesive, pre-printed, flexible vinyl signs for operational instructions or warnings. Sizes suitable for application and visibility, with proper wording for application.

2. Color: Orange with black lettering.

F. Danger Signs:

1. Manufacturer's standard "DANGER" signs, baked enamel finish on 20 gage steel; standard red, black and white graphics; 14" x 10" unless 10" x 7" is largest which can be applied, or where larger size is needed for visibility use recognized explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).

G. Engraved Signs (Nameplates)

1. 1/8" thick melamine plastic laminate, complying with FS LP-387, sizes as indicated, engrave with standard letter style of sizes and wording indicated (1/4" letters minimum) white field, black letters for normal service; red field, white letters for essential service; yellow field, blue letters for D.C. service; orange field, white letters for UPS service. Punched for screws.

2. Fasteners: Self-tapping stainless steel screws, except contact epoxy adhesive where screws cannot or should not penetrate substrate.

H. Lettering and Graphics:

1. Coordinate names, abbreviations and other designations used with those shown or specified. Provide numbers, lettering, and wording as indicated or required for identification and operation/maintenance.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION:

A. General Installation Requirements:

1. After completion of painting.

2. Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Conduit Identification:

1. Where high voltage conduit is exposed, apply identification to conduit.

C. Underground Cable and Duct Identification:

1. During back-filling of underground cable or duct, install continuous marker warning tape, directly over buried line 6" to 12" below finished grade. Where multiple lines are buried in common trench not exceeding 24" width, install a single line marker.

2. Install line marker warning tape for every buried ductbank.

D. Operational Identification and Warnings:

1. Provide operational signs for main switch.

E. Danger Signs:

1. Provide for 5 KV to 35 KV medium voltage switchgear, sectionalizer loop switches, etc., as shown and described herein.

2. Provide as required by codes.

F. Engraved Plastic Laminated Signs: Install on each major unit of electrical equipment in the building. Provide single line of text, 1/4" high lettering on 1" high sign (1-1/2" high where 2 lines required). Matching terminology and numbering of contract documents. Provide signs for each unit of the following categories (signs shall identify item fed, voltage where fed from):

1. Electrical cabinets and enclosures. Indicate voltage.

2. Access panel/doors to electrical facilities.

3. Major electrical switchgear (indicate voltage).

4. Electrical substations.

5. Safety switches and circuit breakers.

6. Transformers.

7. Feeders in pull and junction boxes and in all switchgear. Fasten with nylon ties.

8. All equipment furnished in this Division of the specifications.

9. Install signs where indicated or most visible. Secure with screws or epoxy adhesive. Secure to feeder cables with nylon ties.

10. Nameplate sign shall include system voltage and source of feed (where applicable).

G. Outlet pull, and junction boxes shall be identified with circuit number(s), and source panel or switchgear/switchboard indicated with legible text written with permanent black marker. Write text and box cover.

H. Branch circuit and feeder conductors shall be identified where they enter pullboxes,

switchgear, switchboards, panelboards, transformers, and handholes. Feeder identification shall include source, conductor size, and phase identification.

I. Provide engraved device plates for wiring devices where indicated on drawings or related sections of the specifications.

1. Use black letters for devices on normal circuits; use red letters for essential circuits.

END OF SECTION 16014

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Installation of raceway systems for all work in Division 16 and required fittings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Metallic Raceways:

1. Republic
2. Wheatland
3. Allied
4. Clifton
5. Triangle
6. Walker
7. Western
8. AFC

B. Non-Metallic Raceways

1. Carlon
2. National Pipe & plastics
3. Can-Tex
4. Allied

C. Fittings

1. Thomas & Betts
2. Hubbell: RACO; Killark
3. Appleton
4. Midwest
5. EFCOR
6. OZ Gedney
7. Bridgeport
8. AFC

2.2 RACEWAYS

A. Rigid galvanized steel conduit to conform to ASA Standard C80.1 and U.L. Standard No. 6 for rigid metallic conduit, except hot dipped galvanized after threading.

1. Fittings, ells, couplings, etc., galvanized threaded type meeting above standards. Threadless fittings not allowed.
2. Terminate rigid conduit with two locknuts, one inside, one outside of the cabinet, junction or outlet and a bushing. Bushing - malleable iron with smooth bakelite ring molded into edge of bushing to prevent damage to cable, OZ Mfg. Co., type "B" or approved equal. Where grounding bushings are required, construction of bushing similar to above except a lug provided for grounding connection, OZ type "BLG" or approved equal.

B. Rigid intermediate grade conduit, IMC, to conform to UL Standard No.1242; hot dipped galvanized or approved equivalent.

1. All fittings, ells, couplings, etc., constructed to same standards as rigid steel conduit. Fittings - threaded type with all threads engaged. Use "Uni-swivel" couplings in dry locations only.

2. Conduit terminations same as rigid steel conduit.

C. Flexible steel conduit, "Greenfield", continuous spirally wound and inter-locked, threadless, galvanized conforming to U.L. and CSA Standards for flexible steel conduit.

1. Connectors and fittings galvanized steel, threadless type with insulated throats, U.L. approved for grounding means.

D. Liquid tight flexible steel conduit constructed similar to flexible steel conduit above, except with polyvinyl chloride jacket.

1. Fitting Assembly - sealing type, with steel gland, nylon ring and ground cone inside locknut. All fittings with insulated throat, U.L. approved for grounding means.

E. Electrical metallic tubing, EMT, threadless, steel type conforming to ASA Standard C80.3 galvanized inside and out, and with additional corrosion resistant finish.

1. Fittings, connectors, couplings, etc., insulated throat galvanized steel screw indenter.

F. Plastic conduit, PVC, polyvinyl chloride compound, rated for direct burial, Schedule 40, except as noted otherwise.

1. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.

G. Type EB - encased burial duct: Polyvinyl chloride compound conforming to NEMA Standard TC-6, UL listed and designed for encased burial use.
1. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install conduit as follows:

1. Use rigid steel or intermediate grade conduit for:

a. Transitions from circuits run underground to above ground.
b. Circuits run in concrete in contact with earth.
c. Circuits in hazardous and wet locations.
d. Circuits exposed to mechanical damage.
e. All feeders (1-1/4" diameter and larger).
f. All motor circuits.

2. Use electrical metallic tubing, EMT, for:

   a. Branch circuits (conduit 1" diameter and smaller) in dry locations.

   b. Telephone circuits.

   c. Auxiliary systems and controls (low voltage systems such as fire alarm nurse call sound systems, etc).

   d. Feeders run overhead in dry locations.

   e. Branch circuits in concrete slab (above slab on grade).

3. Use PVC conduit for:

   a. Circuits run underground.
   b. For branch circuits in concrete slab.
   c. Where specifically shown on drawings.
   d. No PVC shall be exposed.

   Note: Do note use PVC in Patient Care Areas.

4. Use type EB conduit for exterior concrete encased application where shown.

B. Size conduit per NEC. Minimum size 3/4" diameter, but no more than 3#12 installed in 3/4" conduit.

C. Run conduit concealed where possible. Run concealed conduit above furred ceiling in an orderly manner. Multiple conduits grouped and run parallel.

D. In concrete slab: Install conduits in center of concrete slabs and tie to reinforcing steel with tie wires. Do not install conduit larger than 1" in concrete slabs unless approved by Architect. Install with minimum of 2" between parallel runs. Do not cross conduits in slab unless necessary, then only one conduit crossover in 12" space.

E. Exposed Conduit: Use only where specifically shown or approved. Run perpendicular to building walls and partitions and tight against structure. Conceal vertical portion of conduits where possible.

F. Paint underground metal conduit with 2 coats of asphaltum or bituminous. Make underground conduit fittings watertight using Teflon tape. Do not use split couplings and similar fittings underground and exposed to moisture. Run underground conduits minimum 24" below grade. Do not run conduit in slag fill.

G. Paint conduit fittings and threads exposed to moisture with Rustoleum silver paint after installation.

H. Furnish offsets required to meet field conditions. Make bends in conduit in accordance with the National Electrical Code, except make minimum radius of 6 times conduit diameter or 6" whichever is greater. Bend IMC conduit without deforming.

I. Where conduit crosses expansion joints, install expansion type fittings OZ type EX with bonding jumper or approved equal.

J. Make connections to equipment away from wall with conduit extensions exposed from

ceiling to floor, anchored with floor flange and/or angle frame as required. Make connections to equipment with flexible conduit from tee condulet in conduit riser.

K. Vibrating equipment and equipment requiring adjustment, i.e.: motors, transformers, etc: make final connections with flexible conduit.

L. Isolate conduit connections to equipment on roof from roof penetration of conduit with short section of flexible conduit between roof penetration and equipment.

M. Use liquidtight flexible conduit where exposed to moisture, oil, etc.

N. Install conduit to avoid hot water pipes. Maintain 9" clearance of such pipes, unless closer crossings are unavoidable. Maintain minimum 1" clearance from covering of pipe crossed.

O. Support conduit per NEC. Support individual conduits with galvanized hangers and rods as follows:

1" diameter and smaller ..... ¼" dia. rod
1-¼" to 3" diameter ..... 3/8" dia. rod
Larger than 3" diameter ..... ½" dia. rod

P. Individual conduit hangers - Minnerallac, or approved equal. Support EMT near each joint. Support for multiple conduit runs consist of Uni-strut channel as required with 1/2" diameter galvanized bolts or rods anchored to structure. Provide "U" bolt clamps for each conduit on hangers. Support vertical riser conduits with galvanized bolted clamps at each floor. Do not support conduit to ceiling support system.

Q. Terminate conduits entering sheet metal boxes with double locknuts and bushings. Terminate conduit exposed to moisture with watertight hubs.

R. Install appropriate seal-off where conduits exit hazardous areas, areas of temperature differential etc.

S. Where ground conductor installed in conduits 1-1/4" and larger provide grounding bushings, and bond full size ground wire to bushings and from bushing to box or cabinet. Bond with self-tapping screw and appropriate lug. Where ground wires are run in smaller conduits, bond to outlet and junction boxes with self-tapping screw lug. Provide other conduits with non-grounding bushings as described under another article. Provide all service entrance metallic raceways with grounding bushing and bond to ground bus; bond sized per N.E.C..

T. Conduit work in hazardous areas, or areas with large temperature differential: Use rigid steel or IMC conduit with sealing fittings, poured with hardening compound after conductors are pulled-in. Seals installed per NEC. Conduit seals Crouse-Hinds type EYS or approved equal.

U. PVC Conduit Installation:

1. Above ground: Allow for expansion and contraction.

2. Below grade: Encase in 3" sand fill. Backfill free of large rocks and debris.

3. Make elbows, bends, etc., with heated bender when factory bends are not available.

   a. When below slab, provide rigid elbows.

4. Make cuts with hacksaw and deburr ends.

5. Make joints as follows:

   a. Clean outside of conduit to depth of socket, and inside of socket with approved cleaner. Apply solvent cement to interior of socket and exterior of conduit, Insert conduit in socket and rotate 1/4 to 1/2 turn and allow to dry.

6. Where non-metallic conduit is used for power wiring install insulated ground wire, sized per NEC unless shown larger.

V. Sleeves:

1. Provide sleeves for raceways penetrating floor and structural members. Sleeves consist of Electrical Metallic Tubing set in forms. (Exception: Use Schedule 40 PVC for individual ground conductors).

2. Size sleeves to allow 1/2" clearance around raceway extending from bottom of floor construction to 2" above floor, minimum sleeve size 2-1/2" diameter. After raceways are installed, seal space between the raceway and sleeve with non-hardening, fireproof, compound, CTC PR-855 sealant, T&B "Flame Safe" for 2 hour fire rating or approved equal.

END OF SECTION 16110

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Furnishing, installing and testing 600 volt conductors for lighting, power, and auxiliary systems.

PART 2 - PRODUCTS

2.1 CONDUCTORS:

A. 98% conductivity copper; #12 AWG minimum; #10 AWG and smaller solid, #8 and larger stranded.

B. Conductors furnished with NEC, 600 volt, insulation as follows:

1. Dry locations:

a. # 6 AWG and smaller]: type THW, THWN or XHHW (do not intermix in circuits)

b. # 4 AWG and larger: type RHH-RHW-USE, (cross linked polyethylene)

2. Wet locations: type RHH-RHW-USE

C. Wiring for controls and auxiliary systems #14 AWG minimum with NEC type THWN insulation.

D. Luminaire Wire: Incandescent - Use type SF-2, #16 for luminaires up to 300 watts, and #14 over 300 watts, except for luminaires in concrete pour use #12 or larger or as shown. Conductors in channels of, and flex to fluorescent luminaires type THHN or XHHW.

E. Ungrounded System Wiring: All wiring connected to the secondary side of isolating transformers: Cross-linked polyethylene insulation with dielectric constant of less than 3.5; 30 mills minimum thickness, resistance constant greater than 20,000 at 60 degrees F, shall be suitable for wet and dry locations. Cable - G.E. No. SI-58053 or approved equivalent.

F. Color Code as follows and/or per local ordinances. Conductors #10 and smaller with colored insulation. Conductors #8 and larger not available in colors, color coded with colored pressure sensitive tape. Apply minimum 2" of tape to each individual phase or neutral conductor in half lapped pattern. The equipment ground conductor shall be taped green for its entire exposed length. Color-code as follows:

Phase	120/208 Volts	Ungrounded	Isolated Power 120/208
A	Black	Orange	Black
B	Red	Brown	Red
C	Blue	Yellow	Blue

Neutral	White	White	White
Eq Grnd	Green	Green	Green
Iso Grd			Green / Black Stripe

G. Manufacturers of copper conductors: Phelps Dodge, Capital Cable, Southwire, Senator, United Copper, Cero Wire & Cable, American, or approved equal.

PART 3 - EXECUTION

A. Install wiring complete with connections to equipment.

B. No wiring installed until after plastering and similar work is complete and dry.

C. Install wiring so conductors are not in tension in completed system.

D. Form wiring neatly and group in circuits. Tie grouped conductors with nylon ties, T&B "Tyrap" or approved equal.

E. Use pulling compound of Ideal "Yellow 77", Minerallac No. 100, or approved equal. Do not use pulling compound for circuits on secondary side of ungrounded isolation transformers.

F. Join and terminate copper conductors individually.

1. Lugs in damp locations connected to copper bus: 98% conductivity copper or bronze Thomas & Betts "Locktite", Burndy "QA" or approved equivalent.

2. Lugs in dry locations and lugs connected to aluminum bus - heavy casting aluminum, CU/AL rated, listed under UL Standard 486B, rated 90 degrees C; plated to prevent electrolysis, Thomas & Betts, Blackburn, Ilsco or approved equivalent.

G. Provide lugs where not furnished as part of equipment - furnish as specified above, to connect all conductors.

H. Furnish lugs for conductors #2/0 and larger with two bolt tongue or approved equivalent.

I. Make conductor taps #8 and larger from a second conductor with 98% conductivity bolted insulated connector, T&B "IDT", Ilsco "KUP-L-TAP" or approved equivalent. Insulate splices with 600 volt "heat shrink" covers T&B or equal.

J. Splice conductors #8 and larger with solid copper barrel, type fittings applied with an appropriate hydraulic tool. Splices used only where approved. Splice fittings: Burndy "Hydent". Insulate splices with 600 volt "heat shrink" covers T&B or equal.

K. Joints #10 and smaller: T&B Sta-Kon wire joints EPT66M, with insulating caps, installed with WT161 Tool or C nest of WT11M Tool; Ideal Super/Nuts; Ideal Wing Nuts; 3M "Scotchlock" or Buchanan Electric Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators installed with C24 pressure tool. Where conductors are connected to screw terminals, use nylon insulated, locking fork, T&B Sta-Kon or approved equal. Where joints are made in damp or wet locations insulate splices

with 600 volt "heat shrink" covers T&B or equal.

L. Provide cable supports: As required by NEC. Supports with malleable screwed conduit fitting and non-conductive wedges drilled for the conductors; O.Z. Manufacturing Company or approved equal. Furnish pullbox, sized per NEC for each cable support.

M. Bond circuit ground wires where installed to all devices, equipment, outlet and junction boxes, and grounding bushings (where provided) with a full size conductor and screw type connection.

N. Securely fasten non-ferrous identifying tapes, pressure sensitive labels or engraved nameplates to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc.

O. Mark all branch circuit conductors at panel terminations including neutrals with pressure sensitive numbers to correspond to circuit numbers connected.

P. Connect circuits and feeders as shown on drawings. Drawings are diagrammatic and do not show every detail required in the wiring system. Detail wiring accomplished per NEC.

Q. All conductors making up parallel feeders to be same size, same type, and same insulation, all cut same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner.

R. DO NOT COMBINE CIRCUITS unless specifically approved by the Architect (or) Engineer. No more than 3 phase or current carrying conductors in a circuit.

END OF SECTION 16120

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Grounding Details

PART 2 - PRODUCTS

2.1 SYSTEM GROUNDING:

A. Bond and ground main service neutral, cabinets, equipment, conduits, metallic piping systems, etc., per the latest edition of NEC.

B. Ground conductors - 98% conductivity copper, either bare or with green THW insulation. Other conductor requirements same as described for low voltage, 600 volts, conductors.

C. Ground Connections:

1. Make with mechanical connectors where accessible and with "Cadweld" or approved equivalent where inaccessible.

2. Use high alloy cast copper and/or silicon bronze mechanical connectors with Hex or Allen head bolts where permitted.

3. Use Burndy "GAR" or approved equivalent.

4. Size as required for piping connections.

5. Thoroughly clean prior to installation of clamps and/or lugs.

6. Use bolted or screwed on mechanical connectors. Do not use clip-on connections.

7. Bond ground conductor to metal raceway at each end of the run.

8. Seal connections between dissimilar metals (i.e.: bronze to steel), with approved epoxy resin.

9. Coat connections with "No-OXID-A" compound as manufactured by Dearborn Chemical Company.

D. Provide lighting and power circuits with green covered ground wire sized per NEC, or as shown, except not smaller than #12 AWG. Bond ground wire to all outlet boxes, junction and pull boxes, cabinets, equipment, etc., with self-tapping screw or bolt and appropriate lug. See Section covering "Raceways" for use of grounding bushing.

2.2 DRIVEN GROUND SYSTEM:

A. Provide driven ground rods and buried ground conductor interconnecting ground rods as required by code.

B. Ground rods 3/4"x10'-0" copper clad steel, Thompson #558 or approved equal. Ground rods installed with tops driven to 1'-6" minimum below grade. Connect ground wire to ground rod with Thompson #493 "U" bolt bronze clamp.

C. Exterior buried ground conductor #2/0, soft drawn, bare, tinned copper, installed 2'-0" minimum below grade.

D. Bond all masses of metal, i.e.: pipes, conduits, fence posts, etc., within 6'-0" of the buried ground conductor to ground conductor with #6 AWG bare, solid, tinned copper wire, attached to object with appropriate clamp, lug, etc.. Obtain complete set of drawings to determine quantity and location of required connections.

E. All connectors lugs, hardware, etc., for building ground system similar to that for other grounding as described above.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUND 'GREEN WIRE CONCEPT':

A. Ground electrical equipment enclosures and conductor enclosures including metal raceways, outlet boxes, cabinets, switch boxes, motor frames, diesel engine frame, transformer cases, metallic piping systems such as water, gas, waste, air and metallic enclosures for all electrical equipment.

B. Provide separate grounding conductor for all circuits to insure adequate ground fault return path.

C. Install separate ground conductors in conduit.

D. Bond green wire to equipment enclosure at source and at apparatus served.

E. Insulate grounding conductor size to carry ground fault current safely. Minimum size for green wire grounding lead per N.E.C. or as indicated.

F. Do not use grounded current return conductors (neutrals) for equipment grounding. Connect common grounding lead to supply side of service disconnect unit only.

G. Do not ground neutral conductor after it has been grounded at service entrance, transformer or generator.

H. Maintain electrical continuity of conduit systems by threaded fittings with joints made-up wrench tight. Install insulated bushing and locknuts on terminating conduits. Provide conduits containing ground wires with grounding bushings bonded to ground wire with short full size jumper.

I. Provide receptacles with approved green covered bonding jumper from the grounding terminal screw connected to outlet box.

J. Install ground rods in quantity to provide a maximum of 5 ohms ground resistance. Where multiple rods required, separate a minimum of 6 feet and interconnect with wire of ground size shown.

K. Test ground systems as specified in Section 16010.

L. Install tags on ground connections to piping or electrode systems for all telephone equipment grounds.

END OF SECTION 16121

SECTION 16130 - OUTLET BOXES, JUNCTION BOXES AND GUTTERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Outlet, junction boxes, conduit bodies, wiring gutters and their installation.

PART 2 - PRODUCTS

2.1 OUTLET AND JUNCTION BOXES:

A. Provide wiring devices, fixtures and special system outlets with outlet box. Use galvanized steel for concealed boxes and exposed boxes in dry locations. Use cast iron conduit fittings similar to "Condulets" or "Unilets" with threaded hubs for exposed boxes outside and exposed to moisture.

B. Concealed outlets and exposed outlets in unfinished spaces for lights, switches, wall receptacles, etc.; consist of standard galvanized steel outlet boxes and plaster rings.

1. Provide 1/16" thick boxes and covers of form and dimension adapted to its specific use and location, kind of fixture to be used and number, size and arrangement of connecting conduits.

2. Provide 3/8" fixture studs where required.

3. Ceiling Outlet Boxes: 4" octagonal or 4-11/16" square as required, due to number of wires, and 2" deep minimum. Ceiling boxes in slabs concrete type. Plaster rings not required for ceiling outlet unless needed for device.

4. Paint junction boxes provided with blank covers to match surroundings, except use blank device plates in finished areas.

5. Switch and receptacle outlet boxes: 4" square with plaster rings as necessary. Provide multigang boxes where shown or required. Provide metal barriers to separate emergency and normal service wiring per N.E.C.

6. Steel City, Appleton, Raco, Bowers or approved equivalent.

C. Use galvanized cast iron boxes, approved equivalent to Crouse-Hinds type "FS" or Appleton condulets, with appropriate covers for wall outlets in exposed conduit work and exposed to moisture.

D. Use galvanized cast iron boxes equivalent to Crouse-Hinds type GRF for ceiling outlets in exposed conduit work exposed to moisture.

E. Use square cut steel outlet boxes for outlets exposed in finished locations. Use round or square to adapt to device installed. Wiremold, Hoffman or approved equivalent.

2.2 LARGE JUNCTION BOXES:

A. Furnish pull, tap and cable support boxes required by NEC for excessive number of 90 degree conduit bends, conductor taps and cable supports.

1. Box construction per NEC and manufactured with galvanized sheet steel, 12 gage minimum, with angle iron frame where required for rigidity; welded or bolted construction. Install bolts to prevent damage to cables in box.

2. Boxes with removable screw type covers and plated screws. Provide split covers where necessary for access. Maximum single piece cover - 36" x 36".

3. Provide separate junction boxes for each feeder. If conduit is installed so separate junction boxes are not practical, one large pull-box may be used with each set of feeder conductors separated by 12 gage steel barriers. Furnish junction box or each compartment in junction box with ground lug for connection of ground wire.

2.3 CONDUIT BODIES:

A. Conduit bodies shall be installed to provide ease of pulling conductors and to provide neat appearance of conduit installation, and as shown on drawings. Conduit bodies constructed of malleable iron or copper free aluminum castings. Bodies shall be finished with standard durable exterior coatings of manufacturer specified. Provide rollers in type "C" and type "LB" bodies, 1-1/4" size and larger. Provide gasketed plated steel or malleable iron covers.

B. Conduit bodies shall be manufactured by Crouse-Hinds, Pyle National, Killark, Appleton or approved equivalent.

2.4 GUTTERS (Wireways):

A. 8" x 8" and smaller - use standard assembly manufactured by Square "D", Walker Electric, B&C Stamping Co., and General Electric. Make special and larger gutters of code grade galvanized sheet steel with hinged covers and approved fastening device.

2.5 SURFACE METAL RACEWAYS:

A. Where indicated on the drawings, wiring shall be run in exposed metal raceways, metal molding or wiremold complete with outlet boxes and fittings. All circuits run in surface metal raceways shall have a ground conductor with green insulation sized per the NEC, but not smaller than No. 12 AWG screw connected to each outlet box. All wiring in surface metal raceways shall be type "THWN" conductors.

PART 3 - EXECUTION

3.1 INSTALLATION OF OUTLET BOXES:

A. Fasten outlet boxes securely to structure.

B. Set all flush outlet boxes so edge of device flange is flush with finished surface.

C. Open no more knockouts in outlet box than required.

D. Seal boxes during construction.

E. Stagger back to back boxes 3" minimum. In rated walls use appropriate U.L. spacing.

F. Coordinate and verify rough-in location and mounting height of all boxes with drawings

and other trades prior to installation.

G. Support All Boxes:

1. Outlet boxes - with 1/4" diameter galvanized rods or bolts anchored to structure.

2. Outlet boxes for surface mounted luminaires on furred ceilings with 3/4" channel iron fastened to ceiling channels. See Section covering "Luminaires".

3. Pull, junction and cable boxes with 3/8" diameter galvanized rods or bolts (4 minimum).

4. Support outlet boxes in metal stud partitions with support that spans between two studs. Caddy "SGB", "TSGB", or "RBS" hangers or equal.

H. Install adjacent outlets at different levels in one vertical line where possible.

I. Provide green covered bonding jumper, screw connected to outlet box in all receptacle boxes.

J. Paint wiring connections in ground mounted outlets or floor outlets in wet locations with "Scotchkote" and fill box with "Duxseal".

K. Mark outlet box covers with permanent ink markers to indicate circuit number(s) and panel of origination. Use black markers for normal service circuits and orange for emergency service.

L. Use 4" octagonal boxes with blank covers for master outlets, installed to permit installation of collars by others.

M. Where outlet boxes installed in unfinished concrete walls or columns, provide 1" deep plaster ring with box and ring set in position before the concrete is poured so concrete will fill around the ring and cover plate can be installed flush with the unfinished surface. In case of brick walls, follow same procedure with mason filling around the plaster ring with mortar.

N. Install all outlets located on columns on centerline of column and bend or shift reinforcing so that the outlet box will be flush with the finished concrete. Provide plaster rings as required so that the plate is flush with the finished plaster or exterior concrete surface.

O. Where outlets installed in waterproofed columns or walls, provide 6"x6"x3" deep wood box placed in the forms before concrete is poured. Box will be removed before waterproofing is applied. General Contractor will waterproof wall and opening, after which Electrical Contractor will install outlet box. General Contractor will grout around box. Set boxes carefully so that cover plates will be flush.

P. Install conduit bodies where shown or where required for sharp bends and/or aesthetics in raceway system. Do not use in lieu of pullboxes except in limited space or as directed by Architect.

3.2 INSTALLATION OF JUNCTION BOXES:

A. All junction boxes shall be accessible.

B. Securely fastened to structure.

C. Exterior below grade boxes shall be embedded 6" of concrete on sides and bottom. Top shall be level with finished grade unless shown otherwise.

D. There shall be no more knockouts opened in any box than are actually required.

E. Protection during construction.

F. Identify (See Section 16014).

3.3 INSTALLATION OF GUTTERS:

A. Mount gutters on 3/4" thick plywood backboard, sized for devices to be mounted, 2 coats of Albi No. 107A fire retardant paint (install label on board), mount all equipment thereon.

B. Run conductors in gutter without reduction in size, entire length of gutter.

C. Connect individual taps from conductor to tapped device with ILSCO insulated tap devices sized for conductors used.

D. Gutter Tops: for copper conductors shall be ILSCO type GTA or PTA with GTC or PTC insulating covers or by "TEE" compression lugs as manufactured by Anderson or Burndy, wrapped with Scotch #33 electrical tape to a thickness which equals insulation level of wire.

END OF SECTION 16130

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Wiring devices and plates (receptacles, switches, Floor service outlets, poke-through assemblies, and multi-outlet assemblies) and their installation.

B. Related Sections:

1. Division 16 Section "Lighting Control Devices"

1.2 DEFINITIONS:

A. EMT: Electromagnetic interface

B. GFCI: Ground-fault circuit interrupter

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor

D. RFI Radio-frequency interference

E. TVSS: Transient voltage surge suppressor

F. UTP: Unshielded twisted pair

1.3 SUBMITTALS:

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

B. Shop Drawings: Listed legends and description of materials and process used for pre-marking wall plates

C. Samples: One (1) for each type of device and wall plate specified in each color specified, as requested by Architect.

D. Field-quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction materials that include labeling conditions.

1.4 QUALITY ASSURANCE:

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one (1) source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one (1) source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 COORDINATION:

A. Receptacles for equipment: Match plug configurations.

1. Cord and Plug Set: Match equipment requirements.

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, the following:

1. Hubbell
2. Cooper
3. Pass & Seymour
4. Leviton
5. Wiremold/Walker

2.2 DEVICES:

A. Furnish devices as shown in Table 1. Catalog numbers establish minimum standard of quality. Submit list of devices with catalog number proposed for review prior to ordering.

B. Use gray color, except in special areas designated elsewhere.

C. Special colors selected from standard available of almond, white, brown, black, or grey. Furnish color chart.

1. Use red color for devices on essential power circuits.

D. Device Plates:

1. Furnish devices with cover plates, .04" thick, type 302, stainless steel with brushed finish.

2. Device plates in special areas to match device color.
3. Furnish configuration of device plates required for multi-gang installations.

4. Furnish weatherproof devices with individual gasketed aluminum or stainless steel covers U. L. listed for wet locations "In-Use".

2.3 GFI RECEPTACLES

A. General Description: Straight blade, non-feed through type. Comply with NEMA WD 1, NEMA WD 6 UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

2.4 CORD AND PLUG SETS:

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket, with green-insulated grounding conductor and equipment-rating ampacity, plus a minimum of 30 percent.

2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SNAP SWITCHES:

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 volt, 20 amp.

2.6 FAN SPEED-CONTROLS:

A. Modular, 120-volt full-wave, solid-state units with integral, quiet on-off switches and audible frequency, and EMI / EFI filters. Comply with UL 1917.

1. Continuously adjustable slider, 1.5 amp.
2. Three-speed adjustable slider, 1.5 amp.

2.7 FLOOR SERVICE FITTINGS:

A. Type: Modular dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular die-cast aluminum with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable

2.8 POKE-THROUGH ASSEMBLIES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems
2. Pass & Seymour / Legrand; Wiring Devices and Accessories
3. Thomas & Betts Corporation
4. Wiremold Company (The)

B. Description: Factory-fabricated and factory-wired assembly of below-floor junction box with multi-channeled, through floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with services indicated.

2. Size: Selected for nominal 3-inch or 4-inch cored holes in floor and matched to floor thickness.

3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.

4. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.

5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of two (2), 4-pair, Category 5e voice and data communication cables.

2.9 MULTI-OUTLET ASSEMBLIES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems
2. Wiremold Company (The)
3. Panduit

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete matching assembly of raceways and receptacles.

C. Raceway Material: Metal with manufacturer's standard finish.

D. Wire: No. 12 AWG

TABLE 1 - BASIS-OF-DESIGN WIRING DEVICES

DEVICE	NEMA CONF.	MANUFACTURER	CATALOG # HEAVY DUTY SPEC GRADE	CATALOG # HOSPITAL GRADE
Single Receptacle	5-20R	Hubbell	HBL5361	HBL8310
Single Receptacle	6-20R	Hubbell	HBL5461	HBL5461
Single Receptacle	14-20R	Hubbell	HBL8410	HBL8410
Single Receptacle	15-20R	Hubbell	HBL8420	HBL8420
Single Receptacle	5-30R	Hubbell	HBL9308	HBL9308
Single Receptacle	6-30R	Hubbell	HBL9330	HBL9330
Single Receptacle	14-30R	Hubbell	HBL9430A with 6ft. rubber cord set	HBL9430A with 6ft. rubber cord set
Single Receptacle	6-50R	Hubbell	HBL9367 w/9368 plug	HBL9367 w/9368 plug
Single Receptacle	14-50R	Hubbell	HBL9450A w/ cord set	HBL9450A w/ cord set
Single Receptacle	15-50R	Hubbell	HBL8450A w/ cord set	HBL8450A w/ cord set
Single Receptacle	L5-20R	Hubbell	HBL2310	HBL2310
Single Receptacle, Portable X-ray	X-Ray 60A, 250V (2P,3W)	Hubbell	N/A	HBL25605 w/ 25615 plug
Duplex Receptacle	5-20R	Hubbell	HBL5362	HBL8300H
Duplex Receptacle, Isolated Ground	5-20R IG	Hubbell	IG5362	IG8362SA
Duplex Receptacle, GFCI, Weatherproof	5-20R GF	Hubbell	GFR5362TR w/ WP26E cover	GFR8300TR w/ WP26E cover
Duplex Receptacle, Tamper-Proof	5-20R TP	Hubbell	HBL8300SG	HBL8300SG
Duplex Receptacle, GFCI	5-20R GF	Hubbell	GFR5362TR	GFR8300HLA
Floor Outlet with Equipment Connection	¾" NPT	Wiremold	881/881ADP-896	881/881ADP-896
Floor Outlet with Duplex Receptacle	5-20R	Wiremold	881/881ADP-895/ HBL5362	881/881ADP-895/ HBL8300H
Floor Outlet Double Duplex Receptacle	5-20R	Wiremold	880MP-827-(2)828R/ HBL5362	880MP-827-(2)828R/ HBL8300H
Wall Switch 1-Pole	20A,120/277V	Hubbell	CS1221	CS1221
Wall Switch 2-Pole	20A,120/277V	Hubbell	CS1222	CS1222
Wall Switch 3-Way	20A,120/277V	Hubbell	CS1223	CS1223
Wall Switch 4-Way	20A,120/277V	Hubbell	CS1224	CS1224
Wall Switch, SPDT Momentary Contact, Center OFF	20A,120/277V	Hubbell	HBL1557	HBL1557
Wall Switch 1-Pole, Locking Key	20A,120/277V	Hubbell	HBL1221L	HBL1221L
Wall Switch 1-Pole, Pilot	20A,120/277V	Hubbell	HBL1221PL	HBL1221PL
Wall Switch 1-Pole Lighted Handle	20A,120/277V	Hubbell	HBL1221ILC	HBL1221ILC

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.

2. Keep outlet boxes free of plaster drywall joint compound, mortar, cement, concrete dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is toweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or picking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300 without pigtails.

4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.

b. Straighten conductors that remain and remove corrosion and foreign matter.

c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-amp circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

10. Devices shall be installed secure, tight, and flush to the wall surface. Install outlet box extension rings or spacers to bring device flush to surface.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

2. Install hospital-grade receptacles in patient-care areas with the ground pin at the top.

F. Device Plates: do not use oversized or extra-deep plates. Repair wall finishes and re-mount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: unless otherwise indicated, mount flush with long dimension vertical and with grounding terminals of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. Adjust location of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

2. Engraving shall be 1/4" high letters.

3. Color of letter fill corresponding to branch of electrical system:

   a. Black for Normal
   b. Red for Essential/Emergency
   c. Blue for UPS

4. Engrave all device plates for receptacles dedicated for utilization by specific equipment with name of equipment served ("X-ray", "Bed", Copier", etc.)

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.

2. Test Instruments: Use instruments that comply with UL 1436.

3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.

3. Ground Impedance: Values of up to 2 ohms are acceptable.

4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.

5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

7. Test straight blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION 16140

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 lighting control devices:

1. Time switches.
2. Outdoor and indoor photoelectric switches and daylight sensors.
3. Switch-box occupancy sensors.
4. Indoor occupancy sensors.
5. Outdoor motion sensors.
6. Multi-pole contactors.
7. Wallbox-style dimmers.

B. Related Sections include the following:

1. Division 16 Section "Switches and Receptacles" for manual light switches.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4 SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

PART 2 - PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

B. Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Hubbell Building Automation, Inc
3. Acuity Brands
4. Eaton
5. Cooper Lighting - Greengate
6. Substitutions: See Section 01600 - Product Requirements.

2.2 TIME SWITCHES

A. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.

1. Contact Configuration: SPDT (Single-Pole Double-Throw)

2. Contact Rating: 20-A ballast load, 120/208/240/277 Vac. Contact output for both maintained and momentary (pulse) to allow control of latching contactors.

3. Programs: 4 channels.

a. For each channel, provide daily, weekly, or yearly schedules with a minimum of 1000 set points and an annual holiday schedule (up to 99 holidays) to override normal schedule.

4. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program on selected channels.

5. Astronomical Time: User scheduled for on or off function of a program on selected channels.

6. Battery Backup: 8 year lithium battery.

7. Memory: All programming and time functions shall be stored in EEPROM non-volatile memory.

8. Surge Protection: Circuitry shall utilize transient voltage surge protection for voltage surges up to 6000V.

9. Manual and Remote override.

B. Wallbox Time Switch: Digital programmable time switch, designed to replace a standard toggle switch, to turn lights OFF after a preset time period.

1. Completely self-contained control system, with standard single-gang switch device mounting and grounding strap with ground wire. Provide with compatible single-gang wallplate, color to match device (See section for "Switches and Receptacles" for device finish).

2. Switching mechanism shall be a latching air gap relay and utilize "zero crossing circuitry" to maximize relay life. Switch shall also be capable of operating as a manual ON-OFF switch.

3. Switch circuitry shall be compatible with all types of lighting loads, including tungsten, halogen, and fluorescent and HID ballasts (electro-magnetic and electronic).

4. Switch shall have no minimum load requirement and be capable of handling up to 800 watts (at 120 volt) or 1200 watts (at 277 volt) of lighting load.

5. Switch circuitry for time-off period shall be adjustable from 5 minutes to 12 hours (increments of 5 minutes up to one hour, and 15 minutes from 1 hour to 12 hours).

6. The time switch shall have optional warnings, including light flash and audible beep, for notifying occupant that the time-off period is expiring.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES

A. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.

2. Time Delay: Instant ON;10-second delay OFF, to prevent false operation.

3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.

4. Mounting: Twist lock receptacle complying with ANSI/IEEE C136.10, with base mounting accessory as required to direct sensor to the North sky exposure.

2.4 INDOOR PHOTOELECTRIC SWITCHES

A. On/Off (closed loop) Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.

2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

3. Light-Level Monitoring Range: 10 to 200 fc (108 to 2150 lx), with an adjustment for turn-on and turn-off levels within that range.

4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.

5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

B. Dimming Control (Open-Loop) for Daylight Compensation: Electronic solid-state controller with separate photo-sensor to measure incoming light and proportionally adjust the dimmer output.

1. Controller Output to Dimmer: 0-10Vdc, compatible with dimming ballasts by Advance, Osram-Sylvania and Lutron. (Ecoyo Series)

2. Control system shall use open-loop algorithms to determine signal output to dimming ballasts.

3. Photosensor: 30-3000 fc monitoring range, low-voltage.

C. Dimming Control (Closed-Loop) for Daylight Compensation: Self-contained, ceiling-mounted control device that detects changes in light levels and raises or lowers electrical fluorescent lighting in response.

1. Controller output to fluorescent dimming ballast is 0-10Vdc, compatible with dimming ballasts by Advance, Osram-Sylvania, and Lutron (ECO10 series).

2. The photosensor shall be low-voltage, powered by 24Vdc power pack.

3. The photosensor shall utilize a photocell that measures only in the visual spectrum and has a response curve that matches the photopic curve. It shall not measure in the ultra violet or infrared range (<5% for wavelengths < 400 nm or > 700 nm).

4. Sensor adjustments shall be made remotely with wireless remote control that shall be furnished with the product.

5. The photosensor shall have a control range of 20 –60 footcandles.

2.5 INDOOR OCCUPANCY SENSORS

A. Switch Box Sensors: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; (rated for 1000 W at 277-V ac).

B. Wall- or ceiling-mounting, sensor.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit. Sensor shall include auxiliary single-pole, double-throw isolated relay.

3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

4. Mounting:

a. Sensor: Suitable for mounting in any position on a standard outlet box.

b. Relay: Externally mounted though a 1/2-inch knockout in a standard electrical enclosure.

c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door or coverplate.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.

6. Bypass Switch: Provide manual OFF/ON function facilitated by installation of a momentary contact switch.

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in..

2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.

3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot high ceiling.

D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.

1. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch high ceiling.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 8-foot high ceiling.

4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch high ceiling.

5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Wall or Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.

2.6 MULTIPOLE LIGHTING CONTACTORS

A. Approved Manufacturers:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Cutler-Hammer; Eaton Corporation.
4. GE Industrial Systems.
5. Square-D

B. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).

2. Control-Coil Voltage: Match control power source.

2.7 WALLBOX-STYLE DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.

1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.

2. Incandescent Lamp Dimmers: Modular, 120V, 60 Hz with continuously adjustable slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch (130-mm) wire connecting leads.

3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 1% of full brightness (depending on ballast-type).

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 18 AWG.

C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 14 AWG.

D. Provide unshielded, twisted-pair cable for control and signal transmission conductors.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install according to manufacturer's instructions. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. Do not install ultrasonic or dual-technology occupancy sensors closer than 4 feet from air supply outlets / diffusers.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 16 Section "Conductors." Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Provide field-mounting transient voltage suppressors for lighting control devices locations that do not have integral line-voltage surge protection.

D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

A. Identify components and power and control wiring.

B. Label time switches and contactors with a unique designation. Provide a typewritten directory identifying circuits and spaces controlled by contactors.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test in compliance with manufacturer recommendations.

2. Operational Test: Verify actuation of each sensor and adjust time delays per manufacturers instructions.

B. Remove and replace lighting control devices where test results indicate that they do not function properly.

C. Additional testing and inspecting, at Contractor's expense, may be performed to determine compliance of work with specified requirements.

3.5 ADJUSTING

A. Occupancy Sensor Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

B. Daylight Sensor Adjustments: Contractor shall provide on-site service to adjust sensors immediately after owner has occupied the space. An additional on-site visit shall be provided up to 12 months from date of substantial completion. At the end of the adjustment period, contractor shall turn-over accessories used for making adjustments, such as wireless remote controls, to the Owner.

END OF SECTION 16145

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Safety switches and disconnects and separately mounted circuit breakers.

B. Provide shop drawing.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES:

A. Heavy duty rated 250 or 600 volts as required; quick-make, quick-break operation; horsepower rated. If switch is not available with proper horsepower rating, classify switch as isolating switch only and provide nameplate reading "DO NOT OPEN UNDER LOAD". Operating handle interlocked with switch door to prevent opening door with switch closed. Provide mechanical over-ride for authorized personnel to open switch door without operating switch handle.

B. Fusible or non-fusible as shown. Furnish Bussman "Fuse-Tron" fuses for each fusible position, size as shown. Furnish 3 spare fuses for each size.

C. Furnish with provisions for locking with padlock. Enclosures for switches NEMA 1, general purpose, NEMA 3R, raintight, or special enclosure, as shown.

D. Standard product of Siemens, Square "D", General Electric, or Cutler Hammer.

2.2 SEPARATELY MOUNTED CIRCUIT BREAKERS:

A. Furnish and install separately mounted circuit breakers for overcurrent protection of feeders and branch circuits where shown on drawings.

B. Circuit breakers: Thermal-magnetic, molded case type, rated 600 volts, with interrupting rating of 22,000 rms amperes symmetrical minimum at 208 volts.

C. Individual circuit breakers shall be mounted in NEMA 1, general purpose surface or flush enclosures as shown.

D. Circuit breakers shall be the standard product of G.E., Siemens, Square "D" or Cutler Hammer.

E. Lock-able switch.

PART 3 - EXECUTION

A. Secure disconnect switches to building or equipment surface as shown. If location shown is not suitable for installing, provide Unistrut P-1000 rack mounted as directed to secure switch.

B. Disconnects shall be located to be accessible and within 5 feet or closer to equipment served.

C. Provide engraved nameplates identifying equipment served, fuse or breaker size. Refer to Specification Section 16014.

END OF SECTION 16170

SECTION 16171 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Documents: Drawings, General Conditions of the Contract and Division 01 Sections apply to this Section

B. Section 16180: Fuses

1.02 SUMMARY:

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Non-fusible switches.
3. Molded-case circuit breakers.
4. Molded-case switches.
5. Enclosures.

1.03 DEFINITIONS

1. GD: - General Duty
2. GFCI: - Ground-Fault Circuit Interrupter
3. HD: - Heavy Duty
4. RMS: - Root Mean Square
5. SPDT: - Single Pole, Double Throw
6. HID - High Intensity Discharge

1.04 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.

4. UL Listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field Quality-control test reports including the following:
1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition, include the following:
1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

PART 2 PRODUCTS

2.01 FUSIBLE AND NON-FUSIBLE SWITCHES:

A. Manufacturers:
1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Fusible switch, NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Non-fusible switch, NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.02 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES:

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 150 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front mounted, field adjustable trip setting.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short –time pickup levels.
   c. Long- and short –time adjustments.
   d. Ground-fault pickup level, time delay, and I^2t response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse

listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

6. GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.

C. Molded-Case Circuit Breaker Feature and Accessories:

1. Standard Frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment, Type HID for High Intensity Discharge lighting loads.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
5. Ground Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings push-to-test feature and ground fault indicator.
6. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.Molded-Case Switch Accessories:

1. Verify that accessories retained below are available and appropriate for molded-case switch types and ratings retained.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
3. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.

2.03 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports and Seismic Restraints."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.04 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges in accordance with overcurrent device study (see Division 16 Section “Overcurrent Protective Device Study”).

3.05 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION

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 the following:

1. Cartridge fuses rated 600 V and less for use in switches.
2. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.

2. Let-through current curves for fuses with current-limiting characteristics.

3. Time-current curves, coordination charts and tables, and related data.

4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.

2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

a. Let-through current curves for fuses with current-limiting characteristics.

b. Time-current curves, coordination charts and tables, and related data.

c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc.
2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
3. Ferraz Shawmut, Inc.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

B. Basis of design products:

1. Class L, current-limiting time delay – Bussman "Low Peak" KRP-C
2. Class RK1, time-delay, dual-element – Bussman "Low Peak", LPS-RK
3. Class RK5, time-delay, dual-element – Bussman "Fusetron" FRS-R
4. Class J, time-delay, dual-element – Bussman "Low Peak" LPJ
5. Class L, fast-acting, current-limiting, Bussman "Limitron" KTU

2.3 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.

2. Finish: Gray, baked enamel.

3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.

4. Fuse Pullers: For each size of fuse.

5. Place in the main electrical room.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits:

1. Motors larger than 5 hp – RK1
2. Motors 5 hp and smaller – RK5

B. Other Branch Circuits: Class RK5, time delay.

C. Feeders:

1. 600 amp and smaller – RK1
2. Larger than 600 amp – Class L time-delay

D. Service Entrance:

1. Larger than 600 amp – Class L fast-acting
2. 600 amp and smaller – Class RK1

E. Low-Voltage Transformer: Class RK1

F. Elevator Machine Disconnect – Class J dual-element, time-delay

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 16180

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.2 RELATED REQUIREMENTS

A. Section 16610 - Lightning Protection for Structures.

B. Section 16060 - Grounding and Bonding for Electrical Systems.

C. Section 16430 - Low-Voltage Switchgear.

D. Section 16442 - Switchboards.

E. Section 16443 - Panelboards.

F. Section 16424 - Motor-Control Centers.

G. Section 16451 - Low-Voltage Busways.

H. Section 16140 - Wiring Devices: Receptacles with integral surge protection.

I. Section 16710 - Structured Cabling: Protectors for communications service entrance.

J. Section 16703 - Fire Detection and Alarm.

1.3 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. MIL-STD-220 - Method of Insertion Loss Measurement 2009c (Validated 2019).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1283 - Standard for Electromagnetic Interference Filters Current Edition, Including All Revisions.

G. UL 1449 - Standard for Surge Protective Devices Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Dewberry Engineers, Inc. of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

SPDs with EMI/RFI filter: Include noise attenuation performance.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:

1. UL 1449.

2. UL 1283 (for Type 2 SPDs).

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual connections and locations of surge protective devices.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years' experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Field-installed, Externally Mounted Surge Protective Devices:

ABB/GE: www.electrification.us.abb.com/#sle.

Current Technology; a brand of Thomas & Betts Power Solutions.

nVent ERICO: www.nvent.com/#sle.

Schneider Electric; Square D Brand Surgelogic Products.

Surge Suppression, LLC (SSI): www.surgesuppression.com/#sle.

B. Factory-installed, Internally Mounted Surge Protective Devices:

1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

C. Substitutions: See Section 016000 - Product Requirements.

D. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

Wye Systems: L-N, L-G, N-G, L-L.

Delta Systems: L-G, L-L.

Single Split Phase Systems: L-N, L-G, N-G, L-L.

High Leg Delta Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):

Equivalent to basis of design.

208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

240/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

480V Delta System Voltage: Not more than 1,800 V for L-G mode and 3,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor clean, dry locations: Type 1.

b. Outdoor locations: Type 3R.

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

Provide surface-mounted SPD where mounted adjacent to surface-mounted equipment.

Provide flush-mounted SPD where mounted adjacent to flush-mounted equipment.

I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.

Switchgear: See Section 16430.

Switchboards: See Section 16442.

Panelboards: See Section 16443.

Motor Control Centers: See Section 16424.

Busway Plug-in Units: See Section 16451.

2.3 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device:

Protection Circuits: Field-replaceable modular.

Surge Current Rating: Not less than 240 kA per mode/480 kA per phase.

Repetitive Surge Current Capacity: Not less than 5,000 impulses.

UL 1449 Nominal Discharge Current (I-n): 20 kA.

UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs.

Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

Diagnostics:

Protection Status Monitoring: Provide indicator lights to report the protection for each phase.

Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.

Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch.

2.4 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Distribution locations include SPDs connected to distribution panelboards, motor control centers, and busway.

B. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular or non-modular.
2. Surge Current Rating: Not less than 160 kA per mode/320 kA per phase.
3. Repetitive Surge Current Capacity: Not less than 3,500 impulses.
4. UL 1449 Nominal Discharge Current (I-n): 20 kA.
5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
6. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs.
7. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
8. Diagnostics:
9. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
10. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
11. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.

12. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.
13. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch.

2.5 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular.
2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.
3. Repetitive Surge Current Capacity: Not less than 2,000 impulses.
4. UL 1449 Nominal Discharge Current (I-n): 20 kA.
5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
6. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs.
7. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
8. Diagnostics:
9. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
10. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
11. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.
12. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

13. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch.

2.6 Powerline cord/direct-wired (120 VAC) suppressors:

A. Suppressors shall consist of a three-stage hybrid design. First stage M.O.V., second stage air-core 300 uh inductor, and third stage silicon avalanche diode.

B. The suppressor shall provide certified test data confirming a fail short failure mode

C. Suppressor shall provide three suppression modes. Line to neutral, line to ground, and neutral to ground.

D. Suppressor shall provide a maximum single impulse current rating of 10,000 amperes (8 x 20 us - waveform) per mode.

E. Suppressor shall provide a pulse life rating of 3,000 amperes (8 x 20 us - waveform) every thirty (30) seconds for 2,000 occurrences.

F. Suppressors maximum clamping voltage when subjected to the ANSI/IEEE C62.41 - 1980, Cat. B (6kv-1.2 x 50 us, 3kA impulse) shall not exceed 450 Volts peak.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 16060, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

E. Provide conductors with minimum ampacity as indicated on the drawings.

F. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

G. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 16060 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

H. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.3 Electronic Power Supply:

A. Install one each powerline cord or direct-wired branch circuit suppressor between each equipment item and its power supply conductors as follows:

1. Fire Alarm Master Panel
2. Building Management System headend
3. Security System headend
4. Telephone switch

B. Install suppressor according to manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Section 7.19.1.

D. Provide and install surge protection devices to meet the requirements of Section 16610 Lightning Protection for Structures.

3.5 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 16289

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.

C. Conductor Connectors: Suitable for use with conductor material.

1. Ground Lugs and Bus Configured Terminators: Compression type.

D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Rating:
   1. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

   1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
   2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
   3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

      a. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
      b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
      c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

C. Fuses are specified in Division 16 Section "Fuses."

2.5 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

1. Load Centers are only allowed for panels; LC-BA, LC-BH, LC-BP, LC-SP, and LC-SA

2. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

3. Bus material: Copper

4. Circuit Breakers: Thermal magnetic plug-in type

5. Enclosures

a. As indicated on the drawings (recessed/surface)

b. Fronts: Provide cover without door to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

c. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

d. Provide circuit directory.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

G. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

H. Ground equipment according to Division 16 Section "Grounding and Bonding."

I. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 16442

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Furnish and install all lighting luminaires, with all necessary accessories and lamps, as shown, specified, and/or scheduled.

1.2 RELATED SECTIONS:

A. See Section for Lighting Control Systems.

B. See Section 16010 or Section 16012 for requirement for submittals.

C. See Division 1 for allowances and Owner-furnished items to be installed under this Section.

1.3 ABBREVIATIONS:

A. H.I.D. - High Intensity Discharge (High Pressure Sodium, Mercury Vapor, Metal Halide)

1.4 SUBMITTALS:

A. Shop drawing submittals for luminaires shall include the following for each luminaire: complete construction details including all dimensions, complete description of materials used, complete electrical data (including operating voltage), photometric test report from an independent testing lab, complete description of finish, and manufacturer catalog cutsheet of lamp to be used.

PART 2 - PRODUCTS

2.1 LUMINAIRES:

A. Furnish and install luminaires as shown in luminaire schedule, or otherwise indicated on the drawings. Manufacturer catalog numbers shown are for general descriptive purposes only, and are intended only to establish the standard of quality.

B. Locations of luminaires on electrical drawings are diagrammatic. Verify location of luminaires with architectural drawings prior to installation. Conflicts between electrical and architectural drawings shall be referred to the Architect for resolution.

C. Provide luminaires complete with all options, accessories and other appurtenances required for a complete installation. Contractor shall verify type of ceiling and wall construction being installed, and provide luminaires properly configured for the type of construction.

D. All luminaires shall be UL listed for the application being installed.

E. Exit signs shall be furnished with 6" high letters with ¾" stroke. Verify color of signage

required by local code authorities. Signs shall meet all NFPA, UL and local building code requirements.

F. Pendant stem mounted luminaires shall be furnished with ball aligner swivel, 30 degrees from vertical minimum, with swivel below canopy, with ½" diameter metal tube (stem).

G. Plastic lenses and shielding shall meet NFPA and local building code requirements for light transmitting plastics.

H. Metal luminaire housings shall be free of tool marks, dents, burrs and sharp edges. All metal parts shall be painted, galvanized, or otherwise corrosion-resistant.

I. Reflector surfaces shall be finished specular, semi-specular, diffuse or painted as indicated. Specular finish materials shall have a minimum reflectance value of 83%. Semi-specular or diffuse finish shall have reflectance of 75% and white painted finish materials shall have reflectance of 88%.

J. Luminaire support wires shall be zinc-coated, soft temper ASTM A641/A641M steel, 12 gage.

K. Luminaires with aircraft cable suspension system shall use 1/16" diameter (minimum) stainless steel aircraft cable and adjustable cable gripper with swaged cable stop at ceiling canopy. Cable size shall be selected by luminaire manufacturer to provide adequate support.

2.2 LEDS:

A. Components: UL 8750 recognized or listed as applicable.

B. Tested in accordance with IES LM-79 and IES LM-80

C. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance,

D. All LED's shall be sorted and provided to have ANSI McAdam Ellipse standard deviation color matching (SDCM) of 2 or better.

2.3 EMERGENCY LIGHTING:

A. Provide luminaires and exit signs with self-contained battery power supplies as indicated. All equipment shall conform to UL924-Emergency Lighting and Power Equipment.

B. Battery shall be sealed, maintenance-free lead-acid type (indoors) or nickel-cadmium (outdoors or unconditioned spaces) with 10-year nominal life. Unit shall incorporate a fully-automatic solid state charger and automatic transformer relay to transformer to backup battery power supply upon failure of normal power.

C. All emergency lighting equipment shall be equipped with means to test operation and an LED indicating battery status.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Support luminaires from structure of the building, independent from the ceiling membrane or finish material. Luminaire shall be set level, plumb, and square with ceilings and walls.

B. Recessed lay-in luminaires in suspended grid ceilings shall be supported from the ceiling grid. Provide devices for securing the luminaire to the ceiling grid to comply with the National Electrical Code ("earthquake clips"). Luminaires heavier than 30 pounds shall have supplemental support wires anchored to the structure above the ceiling. Provide independent support wires, anchored to structure above and attached to fixture at each corner.

C. Recessed luminaires in fire-rated ceiling assemblies shall be installed in accordance with the UL listing of the assembly.

D. Recessed luminaires (non lay-in or hard ceiling types) shall be supported by ¾" steel ceiling channel, or factory-supplied hanger bars one on each side of the luminaire, anchored to ceiling structure. Recessed luminaires heavier than 20 pounds shall have supplemental support anchored to the structure above the ceiling. Do not use conduit to support luminaire.

E. Provide recessed luminaires with appropriate frames, hardware and trim for the ceiling installed.

F. Install luminaires free and clear of structural and mechanical interferences above the ceiling. If location indicated on the drawing conflicts with other elements, notify the Architect for directions for remedial action.

G. Attach surface and pendant mounted luminaires to 3/16" fixture stud in outlet box. Luminaires in excess of 20 pounds shall have supplemental support anchored to the structure above the ceiling.

H. Luminaires surface mounted to grid-type ceilings shall be mounted with Caddy IDS type clips anchored to structure above.

I. Wall mounted luminaires shall be anchored to wall structure. Luminaire shall fully conceal the outlet box.

J. Wiring to luminaires shall be with flexible metallic conduit to junction box. Do not wire luminaire to luminaire unless noted otherwise, or if using manufactured wiring systems.

K. Individual flexible connections under 6 feet in length shall consist of 2#14 and 1#14 (ground) in 3/8" flexible metallic conduit (for circuits 20A or less). Bond ground wire and conduit at each end.

L. Recessed luminaires in insulated ceilings shall be installed so that insulation is no less than 3 inches away from the fixture enclosure unless the luminaire is listed for direct contact with insulation (IC rated).

M. Provide equipment, labor and materials, as needed for final aiming of adjustable luminaires. Aiming shall take place immediately before final occupancy by the Owner.

N. Reflectors, trim cones, and other visible trim of luminaires shall not be installed until completion of ceiling work, and shall be clean and free of dust, fingerprints, scratches, dents etc. upon substantial completion.

END OF SECTION 16510

PART 1 – GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the lighting system performance and design standards for Gadsden State Community College Baseball and Softball Fields using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.

C. The sports lighting will be for the following venues:

1. Baseball Field – 309'/358'/309'
2. Softball Field – 199'/199'/199'

D. The primary goals of this sports lighting project are:

1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.
2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
3. Cost of Ownership: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
4. Control and Monitoring – To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.
    a. Control and monitoring system shall provide contactor control of all existing circuits. Key switches shall be provided to provide field-level control of existing circuit groups.
    b. Entertainment Features: Incorporation of theatrical light shows enhance the presentation and enjoyment of players and spectators. Control system shall incorporate pre-programmed light shows such as "chase", "wave", and "score." Control system shall incorporate the ability to initiate these shows locally. System shall be able to time light shows to customer-supplied music.
    c. Accent Lighting: To allow for custom lighting effects, including team colors, lighting for special occasions, and theatrical effects, all poles should be equipped with RGB accent luminaires to illuminate the structures in various custom colors. Colors should be selectable via an onsite device.

1.2 ONFIELD LIGHTING PERFORMANCE

A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting manufacturers will provide a guarantee that light levels will be sustained over the life of the warranty period. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below.

Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11 and will Incorporate the lumen maintenance projections Into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Baseball Infield	70 foot-candles	2:1	25	30' x 30'
Baseball Outfield	50 foot-candles	2.5:1	96	30' x 30'
Baseball LF Bullpen	25 foot-candles	2.5:1	16	10' x 10'
Baseball RF Bullpen	30 foot-candles	2.5:1	16	10' x 10'
Softball Infield	70 foot-candles	2:1	25	20' x 20'
Softball Outfield	50 foot-candles	2.5:1	73	20' x 20'
Softball LF Bullpen	35 foot-candles	3:1	16	10' x 10'
Softball RF Bullpen	35 foot-candles	2.5:1	12	10' x 10'

B. Color Temperature: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75+.

C. Playability: Lighting design and luminaire selection should be optimized for playability by reducing glare onfield and providing sufficient uplight.

1. Aiming Angles: To reduce glare, luminaire aiming should ensure the top of the luminaire field angle (based on sample photometric reports) is a minimum of 10 degrees below horizontal.
2. Glare Control Technology – Luminaires selected should have glare control technology including, but not limited to: external visors, internal shields and louvres. No symmetrical beam patterns are acceptable.
3. Aerial lighting – Adequate illumination must be provided above the field in order to see the ball in flight. It is recommended that a lighting analysis be performed above the field of play to evaluate the visibility of the ball over its typical trajectory to ensure the participants will adequately see the ball. Calculation planes should be evaluated up to the maximum anticipated height for the level of play.
4. Mounting Heights: To ensure proper aiming angles, minimum mountings heights shall be as described below. Higher mounting heights may be necessary for luminaire with lesser glare control to meet field angle requirements of section 1.2.C.1.

# of Poles	Pole Designation	Pole Height
6	A3-A4, B3-B4, C3-C4	60'
6	A1-A2, B1-B2, C1-C2	70'

1.3 ENVIRONMENTAL LIGHT CONTROL

A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.

B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 feet above grade.

BASEBALL FIELD

	Average	Maximum
150' from edge of baseball field Specified Spill Line Horizontal Footcandles	.1 fc	.2 fc
150' from edge of baseball field Specified Spill Line Max Vertical Footcandles	.2 fc	.4 fc
150' from edge of baseball field Specified Spill Line Max		7500 cd

Candela (taken at 5 ft above grade)		

SOFTBALL FIELD

	Average	Maximum
150' from edge of softball field Specified Spill Line Horizontal Footcandles	.01 fc	.1 fc
150' from edge of softball field Specified Spill Line Max Vertical Footcandles	.04 fc	.23 fc
150' from edge of softball field Specified Spill Line Max Candela (taken at 5 ft above grade)		5500 cd

C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be provided in 30-foot intervals along the boundary line at 3 ft above grade.

D. Sample Photometry: The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

E. Field Verification: Lighting manufacturer shall supply field verification of environmental light control using a meter calibrated within the last 12 months:
   1. Spill verification: Illumination levels shall be taken in accordance with IESNA RP-6-22. The light sensing surface of the light meter should be held 36 inches above the playing surface with the sensing surface horizontal (for horizontal readings) or vertically pointed at the brightest light bank (for max vertical readings)

1.4 Cost of Ownership

A. Manufacturer shall submit a 25-year Cost of Ownership summary that includes energy consumption, anticipated maintenance costs, and control costs. All costs associated with faulty luminaire replacement - equipment rentals, removal and installation labor, and shipping - are to be included in the maintenance costs.

PART 2 – PRODUCT

2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.

B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

C. System Description: Lighting system shall consist of the following:

1. Galvanized steel poles and cross-arm assembly. Alternate: Concrete pole with a minimum of 8,000 psi and installed with concrete backfill will be an acceptable alternative provided building code, wind speed and foundation designs per specifications are adhered to.
2. Non-approved pole technology:
    a. Square static cast concrete poles will not be accepted.
    b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long-term performance concerns.
3. Lighting systems shall use concrete foundations. See Section 2.4 for details.
    a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
    b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or reinforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
4. Manufacturer will supply all drivers and supporting electrical equipment
    a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
    b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002.
5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mi/h winds and maintain luminaire aiming alignment.
7. Control cabinet to provide remote on-off control, monitoring, and entertainment features of the lighting system. See Section 2.3 for further details.
8. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
    a. Integrated grounding via concrete encased electrode grounding system.
    b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780.The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

D. Safety: All system components shall be UL listed for the appropriate application.

2.2 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:
    1. Electric power: 208 Volt, 3 Phase
    2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Energy Consumption: The kW consumption for the field lighting system shall be 105.22kW for both the baseball and softball fields.

2.3 CONTROL

A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

C. Contactor control of lights: To minimize wear on drivers and other electrical components and prevent lights from turning on due to communication loss, circuits must be controlled via contactor switching, not dimming driver output to zero.

D. Dimming: System shall provide for 4-stage dimming (high-medium-low-blackout). Dimming will be set via scheduling options via an onsite user interface tablet or device.

E. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute "early off" commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

F. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

G. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

1. Cumulative hours: shall be tracked to show the total hours used by the facility
2. Report hours saved by using early off and push buttons by users.

H. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.

I. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

J. Entertainment Features: Control System shall store six (4) preprogrammed and (2) customer designated light shows per field with option for customized scenes. Shows shall be initiated by a manufacturer-provided touchscreen user interface on the control system network.

2.4 STRUCTURAL PARAMETERS

A. Wind Loads: Wind loads shall be based on the 2021 International Building Code. Wind loads to be calculated using ASCE 7-16, an ultimate design wind speed of 115mph and exposure category C.

B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).

C. Foundation Design: The foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2021 IBC Table 1806.2.

D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

PART 3 – EXECUTION

3.1 SOIL QUALITY CONTROL

A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:

1. Providing engineered foundation embedment design by a registered engineer in the State of Alabama for soils other than specified soil conditions;
2. Additional materials required to achieve alternate foundation;
3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

3.2 DELIVERY TIMING

B. Delivery Timing Equipment On-Site: The equipment must be on-site 10-12 weeks from receipt of approved submittals and receipt of complete order information.

3.3 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-22.

B. Field Light Level Accountability

1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
2. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.

C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, uplight for aerial visibility, and offsite candela readings are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

3.4 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper

installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.

B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

PART 4 – DESIGN APPROVAL

4.1 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.1.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.

B. Approved Product: Musco's Light-Structure System™ with TLC for LED® is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.

C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. Submit checklist below with submittal.

Yes/ No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics d. Height of light test meter above field surface. e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor.
	D	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	F	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed to not fall below target levels for warranty period.
	G	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Alabama.
	H	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system and entertainment packages. They will also provide ten (10) references of customers currently using proposed system in the state of Alabama.
	I	Electrical Distribution Plans	Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Alabama.
	J	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Alabama.
	K	Project References	Manufacturer to provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of Alabama. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	L	Product Information	Complete bill of material and current brochures/cut sheets for all products being provided.
	M	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	N	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	O	Cost of Ownership	Document cost of ownership as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included. All costs should be based on 25 Years

The information supplied herein shall be used for the purpose of complying with the specifications for Gadsden State Community College Baseball and Softball Fields. By signing below, I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: _____ Signature: _____

Contact Name: _____ Date: _____/_____/_____

Contractor: _____ _ Signature: _____

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Copper cable and terminations.

C. Communications outlets.

D. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 16110 - Raceways

B. Section 16751 – Common Work Results for Communication Systems

C. Section 16726 – Grounding and Bonding for Communication Systems

D. Section 16736 – Cable Trays for Communication Systems

E. Section 16744 – Sleeves and Sleeve Seals for Communication Systems

F. Section 16753 – Identification for Communication Systems

G. Section 16711 – Communications Equipment Room Fittings

H. Section 16716 – Communications Racks, Frames and Enclosures

I. Section 16723 – Communications Optical Fiber Backbone Systems

1.03 REFERENCE STANDARDS

A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment Revision E, 2005.

B. ICEA S-83-596 - Indoor Optical Fiber Cables 2016.

C. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without an Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements 2012.

D. NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling 2006.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices 1988a (Reaffirmed 2012).

G. TIA-492AAAA-B - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009b.

H. TIA-492AAAC-B - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers 2009b.

I. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers 1998 (Reaffirmed 2002).

J. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant 2015a.

K. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant 2015c.

L. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009, with Addendum (2016).

M. TIA-568-C.3 - Optical Fiber Cabling Components Standard 2016.

N. TIA-569-D - Telecommunications Pathways and Spaces 2015d, with Addendum (2016).

O. TIA-598-D - Optical Fiber Cable Color Coding 2014d.

P. TIA-606 - Administration Standard for Telecommunications Infrastructure 2017c.

Q. TIA-606-B - Administration Standard for Telecommunications Infrastructure Rev B, 2012 (with Addenda; 2015).

R. TIA-607-C - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2015c, with Addendum (2017).

S. UL 444 - Communications Cables Current Edition, Including All Revisions.

T. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.

U. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.

3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Dewberry Engineering, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. 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 Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

F. Field Test Reports.

G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

1. Record actual locations of outlet boxes and distribution frames.

2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.

3. Identify distribution frames and equipment rooms by room number on contract drawings.

1.06 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years' experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years' experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).

2. Supervisors and installers factory certified by manufacturers of products to be installed.

3. Employing a BICSI Registered ICT Technician (TECH) for supervision of all work.

4. Principal place of business shall be within 50 miles of project site.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 1-year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cabling and Connectivity Hardware, Category 6:

1. Belden

2. Berk-Tek (Leviton)

3. Commscope Uniprise

4. General Cable

5. Leviton

6. Ortronics (Legrand)

7. Panduit

8. Superior-Essex

9. Substitutions: See Division 01- Product Requirements.

2.02 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569-C (pathways), latest editions (commercial standards).

2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607-B and are UL listed or third-party independent testing laboratory certified.

3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.

4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

5. EXPECT ALL ABOVE CEILING SPACES TO BE PLENUM SPACES IN THIS PROJECT. PLENUM RATED CABLE IS REQUIRED.

B. System Description:

1. Building Entrance Cable:

a. Fiber Optic cable to connect to Gadsden State Community College Network

2. Offices and Work Areas: Provide outlets and cables as noted on the plans. A typical office will have two outlets each with 2 data cables.

3. Television outlets will have one Cat6 data cable.

4. Wireless Access Point (WAP) locations require one (1) Cat6 data cable each, terminated in a surface mount box.

5. Provide other outlets as indicated on drawings.

C. Equipment Room (ER) Main Distribution Frame (MDF): Centrally located support space for terminating horizontal cables that extend to telecommunications outlets, sometimes functioning as point of presence (demarc) to external service providers.

1. Locate Equipment Room as indicated on the drawings.

2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Telecomm Room (TR) Intermediate Distribution Frames (IDF): Support spaces for terminating horizontal cables that extend to telecommunications outlets.

1. Locate Telecomm Rooms as indicated on the drawings.

E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "horizontal links".

2.03 PATHWAYS

A. Conduit: Provide pull cords/strings in all conduits and raceways.

B. Install pathways in accordance to 16110 – Raceways.

2.04 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568-C.2 and listed and labeled as complying with UL 444.

2. Cable Type - Voice and Data: TIA-568-C.2 Category 6 UTP (unshielded twisted pair); 23 AWG.

3. Cable Capacity: 4-pair.
4. Cable Applications:
    a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
    b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
    c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
5. Cable Jacket Color Code
    a. Voice - Yellow
    b. Data - Blue
    c. Security - Green
    d. PA/Intercom – White
    e. Wireless/WAPs - Black
6. Product(s):
    a. Basis of Design: Commscope Uniprise CS34P or equivalent by:
        1) Belden
        2) Berk-Tek
        3) General Cable
        4) Leviton
        5) Ortronics
        6) Panduit
        7) Superior Essex

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Category 6, Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
3. Product(s):
    a. Basis of Design: Commscope Uniprise UNJ600 or equivalent by:
        1) Belden
        2) Hubbell Premise Wiring
        3) Leviton
        4) Ortronics
        5) Panduit
4. Cat6 Modular jack colors:
    a. Voice - Yellow

b. Data - Blue

c. Security - Green

d. PA/Intercom – White

e. Wireless/WAPs - Black

D. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2. Patch Cords for ER (MDF) and TR (IDF) Patch Panels:

a. Quantity: Provide (1) One Cat6 patch cord for each terminated patch panel port.

b. Lengths:

1) 50% to be 1-foot

2) 25% to be 2-foot

3) 25% to be 3-foot

3. Cat6 patch cord colors:

a. Voice - Yellow

b. Data - Blue

c. Security - Green

d. PA/Intercom – White

e. Wireless/WAPs - Black

4. Patch Cords for Work Areas:

a. Work area and device patch cords are Owner-Furnished, Owner-Installed (OFOI).

5. Product(s):

a. Provide Cat6 patch cords from same manufacturer as connectivity hardware. This is a requirement to comply with the manufacturer's enhanced (extended) applications warranty.

2.05 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 270528, "Pathways for Communication Systems".

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

2. Minimum Size, Unless Otherwise Indicated:

a. Voice Only Outlets: 4-11/16 inch by 2 inch by 2-1/8 inch deep (119 by 50 by 54 mm) trade size.

b. Data or Combination Voice/Data Outlets: 4-11/16-inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

c. Fiber Optic Outlets: 4-11/16-inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

B. Wall Plates:

1. Comply with system design standards and UL 514C.

2. Accepts modular jacks/inserts.
3. Equipped with removable, acrylic label window inserts at top and bottom of plate.
4. Capacity:
   a. Voice Only Outlets: 4 ports.
   b. Data or Combination Voice/Data Outlets: 4 ports.
5. Wall Plate Material/Finish - Flush-Mounted Outlets: Match Division 26 wiring devices and wall plate finishes, unless otherwise specified.
6. Provide matching blank inserts for all unused port openings.
7. Manufacturers:
   1) Belden
   2) Commscope Uniprise
   3) Hubbell Premise Wiring
   4) Leviton
   5) Ortronics
   6) Panduit

2.06 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607-B.

2.07 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.
B. Comply with TIA-606-B.

2.08 SOURCE QUALITY CONTROL

A. Factory test cables according to TIA-568.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569-C (pathways), TIA-607-B (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
B. Comply with Communication Service Provider requirements.
C. Grounding and Bonding: Perform in accordance with TIA-607-B and NFPA 70.
D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.02 INSTALLATION OF EQUIPMENT AND CABLING

A. Cat 6 UTP Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

5. Protect and temporarily support all cables and bundles of cables in the ER and each TR during construction. Cable bundles shall not be left on floors during construction except on a daily basis where contractor is on-site and actively placing and installing cabling.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Racks, Cabinets and Distribution Frames: 120-inches.

2. At Outlets - Copper: 12-inches.

3. At Outlets - Optical Fiber: 36-inches.

C. Copper Cabling:

1. Category 6: Maintain cable geometry up to point of termination. However, do not untwist more than 1/4 inch from point of termination.

2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.

3. Use T568B wiring configuration.

D. Identification:

1. Comply with section 16753 – Identification for Communication Systems.

2. Use wire and cable markers to identify cables at each end. Self-laminating, wrap-type labels shall be used for permanent labeling at each end of every cable. Labels shall be applied within 6-inches of termination point at each end.

3. Use manufacturer-furnished label inserts, identification labels or engraved wall plate to identify each jack at communications outlets with unique identifier.

4. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

5. All permanent device and cable labeling shall be machine generated. Handwritten labeling shall not be acceptable for any permanent labeling.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:

1. Inspect cable jackets for certification markings.

2. Inspect cable terminations for color coded labels of proper type.

3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:

1. Test backbone cables after termination but before cross-connection.

2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.

3. Test operation of shorting bars in connection blocks.

4. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
5. Test horizontal UTP cables with a Cat 5e/6/6a/8, Level 2G/VI, copper cable certifier/ test set. Certify each cable for Category 6 performance following 'permanent link' test requirements. Submit one, permanent link test report per terminated, Cat6 cable.
6. Approved cable certifier/test set manufacturers: AEM, Fluke Networks and Trend Networks.
7. Cable certifier/test set shall be within current calibration cycle and operating on latest software revision provided by the manufacturer. Cable certifier/test set shall have been factory calibrated no more than one (1) year prior to time of cable testing. Test reports which are submitted from an out-of-calibration certifier/tester will be rejected. Retesting costs and fees shall be entirely borne by the contractor.

END OF SECTION 16710

SECTION 16711 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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. Backboards.
2. Boxes and Enclosures.

B. Related Requirements:

1. 16736 - Cable Trays For Telecommunications.
2. Section 16710 -Structured Cabling for Voice and Data.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. RCDD: Registered Communications Distribution Designer.

D. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

E. TTB: Telephone Termination Board (aka, Backboard)

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of Contractor's RCDD.
2. Installation Supervision: Installation shall be under direct supervision of a BICSI Technician or Installer 2, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as an RCDD to perform the on-site inspection.

1.7 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7, Telcordia GR-63-CORE requirements for Zone 4 Seismic Earthquake Environments.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.8 BACKBOARDS

A. Backboards:
1. Fire-retardant/treated Plywood.
2. Factory stamped/marked with an indelible ink indicating fire rating.

3. Nominal dimensions: ¾ inch by 48-inches by-96 inches (19 by 1220 by 2440 mm).
4. Type/grade AC, installed with smooth side to interior of ER/MDF and TRs/IDFs.

1.9 BOXES AND ENCLOSURES

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed and labeled for intended location and use.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD, ferrous alloy or aluminum, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: 4-11/16 inches square by 2-1/8 inches deep (119 mm square by 60 mm deep) 4-11/16 inches by 2-1/8 inches by 2-1/8 inches deep (119 mm by 60 mm by 60 mm deep).

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R or Type 4. with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic PVC or Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

1.10 POWER STRIPS AND UPS BATTERY BACKUPS

A. Power strips and UPS battery back-up appliances will be Owner-Furnished, Owner-Installed (OFOI).

PART 2 - EXECUTION

2.1 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

B. Comply with requirements in Section 16110 - Raceways for materials and installation requirements for underground/buried and aerial pathways.

2.2 INSTALLATION

A. Comply with NECA 1, "Standard for Good Workmanship".

B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of all communications equipment in racks, cabinets and enclosures with the Owner and/or the Owner's IT services provider. This shall include:
   1. Contractor-furnished, Contractor-installed equipment.
   2. Owner-furnished, Owner-installed (OFOI) equipment.
   3. Owner-furnished, Contractor-installed (OFCI) equipment.

F. Coordinate service entrance configuration with the respective service provider.

   1. Meet jointly with systems providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
   2. Record agreements reached in meetings and distribute them to other participants.
   3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
   4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

G. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

H. Backboards:

   1. Install from 6-inches (150 mm) to 8-feet, 6-inches (2588 mm) above finished floor. If plywood is fire rated, ensure that a minimum of one fire-rating stamp is visible after installation.
   2. Paint all sides of backboard with two coats of a latex-based white or very light-colored paint.
   3. Install plywood with smooth side to interior of ER/TR space.
   4. Secure plywood backboards to the substrate using manufacturer's approved hardware in a quantity to ensure installed backboard can fully support a minimum load of 50 pounds per square foot.
   5. Unless otherwise noted, install plywood backboards with longest dimension vertical.
   6. Mask-off or otherwise leave an unpainted section of the backboard showing fire-retardancy stamp/marking. This unpainted stamp/marking shall be left in a conspicuous location on the lower half of each sheet of installed plywood.
   7. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569-D.

2.3 SLEEVE AND SLEEVE SEAL INSTALLATION FOR PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

2.4 FIRESTOPPING

A. Comply with TIA-569-D, Annex A, "Firestopping."

B. Comply with BICSI's "Information Technology Systems Installation Methods Manual," "Firestopping Practices" Chapter 7.

END OF SECTION

SECTION 16716 - COMMUNICATIONS RACKS, FRAMES, AND ENCLOSURES

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. 19-inch equipment racks, two and four post.
2. 19-inch freestanding and wall-mounted equipment cabinets (enclosures)
3. Grounding.
4. Labeling.

B. Related Requirements:

1. Section 16716 "Communications Equipment Room Fittings" for backboards and accessories.
2. Section 16726 "Grounding and Bonding for Telecommunications Equipment" for TMGBs and PBBs.
3. Section 16736 "Cable Trays for Communications Systems" for cable trays and cable tray accessories.
4. Section 16710 "Structured Cabling for Voice and Data" for copper data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. LAN: Local area network.

D. RCDD: Registered communications distribution designer.

E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

F. PBB: Primary Bonding Busbar (formerly TMGB: Telecommunications main grounding bus bar)

G. SBB: Secondary Bonding Busbar (formerly TGB: Telecommunications grounding bus bar)

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of PBB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of Contractor's RCDD.
2. Installation Supervision: Installation shall be under direct supervision of Contractor's BICSI Certified Technician or Installer 2 who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as an RCDD to perform on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and Telcordia GR-63-CORE requirements for Zone 4 Seismic Earthquake Environments.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. UL listed.

C. RoHS compliant.

2.2 19-INCH EQUIPMENT RACKS

A. Description: Two and four post racks with threaded rails designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch (482.6-mm) equipment mounting with an opening of 17.72-inches (450-mm) between rails.

B. General Requirements:

1. Frames: Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Extruded steel and extruded aluminum.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

C. Floor-Mounted Racks:

1. Overall height: 84-inches (2133.6 mm).
2. Overall depth: 23-inches (584.2 mm) for two-post rack. Four-post rack shall have adjustable depth up to a maximum of 42-inches (1067 mm).
3. Upright rail "C-Channel" depth: 6-inches (152.4 mm)
4. Two-Post Load Rating: 400 lb (181 kg)
5. Four-Post Load Rating: 2000 lb (907 kg)
6. Number of Rack Units per Rack: 45 or as otherwise indicated on drawings.
   a. Numbering: Every rack unit, on interior of rack, from bottom to top.

7. Threads: 10-32 or 12-24 tapped at EIA/TIA spacing or universal square to accept captive (cage) nut hardware.

8. Provide floor-mounted racks from one of the following manufacturers:
    a. Belden
    b. B-Line
    c. Commscope
    d. Chatsworth
    e. Great Lakes
    f. Hoffman
    g. Middle Atlantic/Legrand
    h. Panduit
    i. Tripp Lite
9. Base shall have a minimum of four mounting holes for permanent attachment to floor.
10. Top shall have provisions for attaching to cable ladder tray.

D. Wall-Mounted Racks:

1. Height: As indicated on drawings.
2. Minimum Depth: 23 inches (584.2 mm)
3. Load Rating: 200 lb (91 kg).
4. Number of Rack Units per Rack: As indicated on drawings.
5. Threads: 10-32 or 12-24 tapped at EIA/TIA spacing or Universal Square designed to accept captive (cage) nut hardware.
6. Wall Attachment: Minimum of eight attachment points spaced at 16-inches and 24-inches
7. Equipment Access: Integral swing to provide access to rear of rack and mounted equipment.
8. Provide wall-mounted racks from one of the following manufacturers:
    a. Belden
    b. B-Line
    c. Commscope
    d. Chatsworth
    e. Great Lakes
    f. Hoffman
    g. Middle Atlantic/Legrand
    h. Panduit
    i. Tripp Lite

2.3 19-INCH EQUIPMENT CABINETS

A. Description: Manufacturer-assembled four-post frame enclosed by side and top panels, front and rear doors, designed for mounting telecommunications equipment. Width is compatible with EIA/ECIA 310-E, 19-inch (482.6-mm) equipment mounting with an opening of 17.72 inches (450 mm) between rails.

B. General Cabinet Requirements:

1. Modular units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
2. Material: Extruded steel, extruded aluminum, sheet steel and sheet aluminum.
3. Finish: Manufacturer's standard, baked-polyester powder coat.
4. Color: Black.

C. Modular Freestanding Cabinets:

1. Overall height: 84 inches (2133.6 mm) or as indicated on drawings.
2. Overall minimum Depth: 36 inches (914.4mm)

3. Load Rating: 3000 lb (1362 kg)
4. Number of Rack Units: 42, 45 or as indicated on drawings.
   a. Numbering: Every rack unit, on interior of rack, from bottom to top.
5. Threads: 10-32, 12-24 or Universal square to accept captive (cage) nut hardware.
6. Removable and lockable side panels.
7. Vented/perforated modular roof panel equipped with cable access knockouts and fan mount openings.
8. Hinged, lockable and vented/perforated front doors.
9. Hinged, lockable and split (aka barn door) vented/perforated rear doors.
10. Adjustable feet for leveling.
11. Cable access provisions in roof and base.
12. SBB that is rack mounted.
13. Roof-mounted, 550-cfm (260-L/s) fan with filter.
14. All cabinets keyed alike.
15. Provide modular, freestanding cabinets from one of the following manufacturers:
    a. APC
    b. Belden
    c. B-Line
    d. Commscope
    e. Chatsworth
    f. Great Lakes
    g. Hoffman
    h. Middle Atlantic/Legrand
    i. Panduit
    j. Tripp Lite

D. Modular Wall Cabinets:

1. Height: As indicated on Drawings.
2. Minimum Depth: 23 inches (584.2 mm)
3. Load Rating: 200 lb (91 kg)
4. Number of Rack Units: As indicated on Drawings.
5. Adjustable "C-channel" rails at front of enclosure.
6. Threads: 10-32 or 12-24 and universal square to accept captive (cage) nut hardware.
7. Wall Attachment: Minimum of eight attachment points spaced at 16-inches and 24-inches
8. Dual-swing style enclosure with separate, hinged access to cabinet body and front door.
9. Vented/perforated roof section equipped with cable access knockouts and fan mount openings.
10. Hinged, lockable and vented/perforated front door.
11. Louvered side panels.
12. Cable access provisions top and bottom.
13. Grounding lug.
14. Roof-mounted, 250-cfm (118-L/s) fan.
15. All cabinets keyed alike.
16. Color: Black.
17. Provide modular, wall-mounted cabinets from one of the following manufacturers:
    a. APC
    b. Belden
    c. B-Line
    d. Commscope
    e. Chatsworth
    f. Great Lakes
    g. Hoffman
    h. Middle Atlantic/Legrand

i. Panduit
j. Tripp Lite

2.4 CABLE/WIRE MANAGEMENT

A. Description: Horizontal and vertical wire management hardware designed for proper and aesthetic routing, managing and maintaining of patch and equipment cross connect cords. Width is compatible with EIA/ECIA 310-E, 19-inch (482.6-mm) equipment mounting with an opening of 17.72 inches (450 mm) between rails.

B. Horizontal managers
1. 2U high x 19 inch with integrated front and rear cable management rings/fingers.
2. Metal construction with integrated, hinged and removable front and rear covers
3. Color: Black
4. Provide quantities as shown on drawings.

C. Vertical managers
1. 6 inch wide by 10-inch-deep x 7 feet.
2. Integrated divider with pass through opening to separate front/rear section.
3. Metal construction with integrated, hinged and removable front and rear doors sections.
4. Color: Black
5. Provide quantities as shown on drawings. Otherwise, a single rack shall be equipped with two vertical managers, two racks shall be equipped with three vertical managers, etc.

D. Provide wire management from one of the following manufacturers:
a. Belden
b. B-Line
c. Commscope
d. Chatsworth
e. Great Lakes
f. Hoffman
g. Hubbell Premise Wiring
h. Leviton
i. Middle Atlantic/Legrand
j. Ortronics/Legrand
k. Panduit
l. Tripp Lite

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 "Standard for Good Workmanship".

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks.

F. Reference drawing sheets for the layout of the ER and TRs, including rack and cabinet mounting locations.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

G. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Comply with Section 16726 "Grounding and Bonding (Earthing) for Communications Systems."

C. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection"

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 16753 "Identification for Communication Systems."

B. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2, Class 3, and Class 4 level of administration, including optional identification requirements of this standard.

END OF SECTION

SECTION 16723 - COMMUNICATIONS OPTICAL FIBER BACKBONE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type OFNR optical fiber cable.
2. Type OFCR optical fiber cable.
3. Type OFNP optical fiber cable.
4. Type OFCP optical fiber cable.
5. Optical fiber cable hardware.

1.2 DEFINITIONS

A. Conductive Cable: Cable containing non-current-carrying and electrically conductive members such as metallic strength members and metallic vapor barriers.

B. Cross-Connect: A facility enabling termination of cable elements and their interconnection or cross-connection.

C. Type OFCP: Conductive cable for use in plenums, ducts, and other spaces used for environmental air.

D. Type OFCR: Conductive cable for use as riser in vertical shafts or from floor to floor.

E. Type OFNP: Nonconductive cable for use in plenums, ducts, and other spaces used for environmental air.

F. Type OFNR: Nonconductive cable for use as riser in vertical shafts or from floor to floor.

1.3 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.4 ACTION SUBMITTALS

1. Type OFNR optical fiber cable.
2. Type OFCR optical fiber cable.
3. Type OFNP optical fiber cable.
4. Type OFCP optical fiber cable.
5. Optical fiber cable hardware.

B. Shop Drawings:

1. System Labeling Schedules:

a. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.

2. Cabling administration drawings and printouts.
3. Wiring diagrams showing typical schematic arrangement, including the following:

a. Telecommunications rooms plans and elevations.
b. Telecommunications pathways.
c. Telecommunications system access points.
d. Telecommunications grounding system.
e. Cross-connects.
f. Patch panels.
g. Patch cords.

4. Cross-Connect and Patch-Panel Drawings: Detail mounting assemblies and show elevations and physical relationship between installed components.

C. Certificates: For each type of product.

D. Field Quality-Control Reports: Optical fiber cable testing plan.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For optical fiber cable, splices, and connectors.

B. Optical fiber test reports.

C. As-built drawings.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish to Owner extra materials, from same production run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Include the following:

1. Duplex Fiber Optic Patch Cord (Jumper): Qty. 4 of each type specified

1.8 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet-work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

B. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine continuity of strand end to end. Use optical fiber flashlight, optical loss test set or bare fiber adapter.
2. Test optical fiber cable while on reels. Use optical time domain reflectometer to verify cable length and locate cable defects, splices, and connector, including loss value of each. Retain test data and include record in maintenance data.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Provide optical fiber backbone system cables, termination hardware and components from the following manufacturer's:
1. AFL
2. Belden
3. Berk-Tek
4. Commscope
5. Corning
6. General Cable; Prysmian Cables & Systems; Prysmian Group NA
7. Hubbell Premise Wiring
8. Leviton
9. Ortronics; Legrand NA
10. Panduit
11. Superior Essex

2.2 TYPE OFNR OPTICAL FIBER CABLE

A. Type OFNR Optical Fiber Cable: This category covers jacketed optical fiber cable for use as risers in vertical runs in shaft or between floors within buildings in accordance with Article 770 of NFPA 70 containing no electrically conductive materials.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN QAYK; including UL 1651.
3. General Characteristics:

a. Performance: TIA-568.3.
b. Inside Plant Mechanical Properties: ICEA S-83-596.
c. Inside-Outside Plant Mechanical Properties: ICEA S-104-696.
d. Jacket:

1) Cable cordage jacket, fiber, unit, and group color in accordance with TIA-598.
2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40-inch (1 m).

C. Type OFNR, Designation OM3, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAC; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 1500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 2000 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 6, 12, 24 and 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.

D. Type OFNR, Designation OM4, Multimode Optical Fiber Cable
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAD; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 3500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 4700 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 6, 12, 24 and 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.

E. Type OFNR, Designation OS1, Inside-Outside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6 and 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96 and 144-fiber, multi-unit, loose tube, optical fiber cable.
3) Dry water blocking compound.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Black.

F. Type OFNR, Designation OS2, Inside-Outside Plant, Single-Mode Optical Fiber Cable
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6 and 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96 and 144-fiber, multi-unit, loose tube, optical fiber cable.
3) Dry water blocking compound.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Black.

G. Type OFNR, Designation OS1, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration: 6, 8, 12, 24, 36, 48, 72, 96, 144-fibers, tight buffered, optical fiber cable.
b. Maximum Attenuation: 1.0 dB/km at 1310 nm wavelength; 1.0 dB/km at 1550 nm wavelength.
c. Jacket Color: Yellow.

H. Type OFNR, Designation OS2, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6 and 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96 and 144-fiber, multi-unit, loose tube, optical fiber cable.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Yellow.

2.3 TYPE OFCR OPTICAL FIBER CABLE

A. Type OFCR Optical Fiber Cable: This category covers jacketed optical fiber cable for use as risers in vertical runs in shaft or between floors within buildings in accordance with Article 770 of NFPA 70 containing non-current-carrying and electrically conductive materials.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN QAYK; including UL 1651.
3. General Characteristics:

a. Performance: TIA-568.3.
b. Inside Plant Mechanical Properties: ICEA S-83-596.
c. Inside-Outside Plant Mechanical Properties: ICEA S-104-696.
d. Jacket:

1) Cable cordage jacket, fiber, unit, and group color in accordance with TIA-598.
2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40-inch (1 m).

C. Type OFCR, Designation OM3, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAC; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 1500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 2000 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 4, 6, 8, 12, 24, 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.
d. Armor: Aluminum interlocking.

D. Type OFCR, Designation OM4, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAD; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 3500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 4700 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 4, 6, 8, 12, 24, 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.
d. Armor: Aluminum interlocking.

E. Type OFCR, Designation OS1, Inside-Outside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

1) 6 and 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96 and 144-fiber, multi-unit, loose tube, optical fiber cable.
3) Dry water blocking compound.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Black.
d. Armor: Aluminum interlocking.

F. Type OFCR, Designation OS2, Inside-Outside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6 and 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96 and 144-fiber, multi-unit, loose tube, optical fiber cable.
3) Dry water blocking compound.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Black
d. Armor: Aluminum interlocking.

G. Type OFCR, Designation OS1, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6, 8, 12, 24, 36, 48, 72, 96 and 144-fiber, tight buffered, optical fiber cable.

b. Maximum Attenuation: 1.0 dB/km at 1310 nm wavelength; 1.0 dB/km at 1550 nm wavelength.
c. Jacket Color: Yellow.
d. Armor: Aluminum interlocking.

H. Type OFCR, Designation OS2, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6 and 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96 and 144-fiber, multi-unit, loose tube, optical fiber cable

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Yellow.
d. Armor: Aluminum interlocking.

2.4 TYPE OFNP OPTICAL FIBER CABLE

A. Type OFNP Optical Fiber Cable: This category covers jacketed optical fiber cable for use in vertical runs in plenums, ducts, or other spaces used for environmental air within buildings in accordance with Article 770 of NFPA 70 containing no electrically conductive materials.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN QAYK; including UL 1651.
3. General Characteristics:

a. Performance: TIA-568.3.
b. Inside Plant Mechanical Properties: ICEA S-83-596.
c. Inside-Outside Plant Mechanical Properties: ICEA S-104-696.
d. Jacket:

1) Cable cordage jacket, fiber, unit, and group color in accordance with TIA-598.

2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40-inch (1 m).

C. Type OFNP, Designation OM3, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAC; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 1500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 2000 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 4, 6, 8, 12, 24, 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.

D. Type OFNP, Designation OM4, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAD; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 3500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 4700 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 4, 6, 8, 12, 24, 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.

E. Type OFNP, Designation OS1, Inside-Outside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6, 8, 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96, 144-fiber, multi-unit, loose tube, optical fiber cable.
3) Dry water blocking compound.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.
c. Jacket Color: Black.

F. Type OFNP, Designation OS2, Inside-Outside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6, 8, 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96, 144-fiber, multi-unit, loose tube, optical fiber cable.
3) Dry water blocking compound.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.

c. Jacket color: Black.

G. Type OFNP, Designation OS1, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration: 6, 8, 12, 24, 36, 48, 72, 96 and 144-fiber, tight buffered, optical fiber cable.
b. Maximum Attenuation: 1.0 dB/km at 1310 nm wavelength; 1.0 dB/km at 1550 nm wavelength.
c. Jacket Color: Yellow.

H. Type OFNP, Designation OS2, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6, 8, 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96, 144-fiber, multi-unit, loose tube, optical fiber cable.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.

c. Jacket color: Yellow.

2.5 TYPE OFCP OPTICAL FIBER CABLE

A. Type OFCP Optical Fiber Cable: This category covers jacketed optical fiber cable for use in vertical runs in plenums, ducts, or other spaces used for environmental air within buildings in accordance with Article 770 of NFPA 70 containing non-current-carrying electrically conductive materials.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN QAYK; including UL 1651.
3. General Characteristics:

a. Performance: TIA-568.3.
b. Inside Plant Mechanical Properties: ICEA S-83-596.
c. Inside-Outside Plant Mechanical Properties: ICEA S-104-696.
d. Jacket:

1) Cable cordage jacket, fiber, unit, and group color in accordance with TIA-598.
2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40-inch (1 m).

C. Type OFCP, Designation OM3, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492AAAC; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 1500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
c. Minimum Effective Modal Bandwidth-Length Product: 2000 MHz-km at 850 nm wavelength.

3. Options:

a. Configuration: 4, 6, 8, 12, 24, 48-fiber, tight buffer, optical fiber cable.
b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
c. Jacket Color: Aqua.
d. Armor: Aluminum interlocking.

D. Type OFCP, Designation OM4, Multimode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.

2. Additional Characteristics:

    a. Construction: TIA-492AAAD; 850 nm laser-optimized, 50 µm core diameter, 125 µm cladding diameter.
    b. Minimum Overfilled Modal Bandwidth-Length Product: 3500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.
    c. Minimum Effective Modal Bandwidth-Length Product: 4700 MHz-km at 850 nm wavelength.

3. Options:

    a. Configuration: 4, 6, 8, 12, 24, 48-fiber, tight buffer, optical fiber cable.
    b. Maximum Attenuation: 3.50 dB/km at 850 nm wavelength; 1.5 dB/km at 1300 nm wavelength.
    c. Jacket Color: Aqua.
    d. Armor: Aluminum interlocking.

E. Type OFCP, Designation OS1, Inside-Outside Plant, Single-Mode Optical Fiber Cable
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

    a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
    b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

        1) 6, 8, 12-fiber, single unit, loose tube, optical fiber cable.
        2) 24, 36, 48, 72, 96, 144-fiber, multi-unit, loose tube, optical fiber cable.

    b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.

    c. Jacket color: Black.
    d. Armor: Aluminum interlocking.

F. Type OFCP, Designation OS2, Inside-Outside Plant, Single-Mode Optical Fiber Cable
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

    a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
    b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

    a. Configuration:

        1) 6, 8, 12-fiber, single unit, loose tube, optical fiber cable.
        2) 24, 36, 48, 72, 96, 144-fiber, multi-unit, loose tube, optical fiber cable.

    b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.

c. Jacket color: Black.
d. Armor: Aluminum interlocking.

G. Type OFCP, Designation OS1, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAA; 9 µm core diameter, 125 µm cladding diameter.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration: 6, 8, 12, 24, 36, 48, 72, 96 and 144-fiber, tight buffered, optical fiber cable.
b. Maximum Attenuation: 1.0 dB/km at 1310 nm wavelength; 1.0 dB/km at 1550 nm wavelength.
c. Jacket Color: Yellow.
d. Armor: Aluminum interlocking.

H. Type OFCP, Designation OS2, Inside Plant, Single-Mode Optical Fiber Cable.
1. Source Limitations: Obtain products from single manufacturer.
2. Additional Characteristics:

a. Construction: TIA-492CAAB; 9 µm core diameter, 125 µm cladding diameter, with low water peak.
b. Minimum Overfilled Modal Bandwidth-Length Product: 500 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

3. Options:

a. Configuration:

1) 6, 8, 12-fiber, single unit, loose tube, optical fiber cable.
2) 24, 36, 48, 72, 96, 144-fiber, multi-unit, loose tube, optical fiber cable.

b. Maximum Attenuation: 0.5 dB/km at 1310 nm wavelength; 0.5 dB/km at 1550 nm wavelength.

c. Jacket color: Yellow.
d. Armor: Aluminum interlocking.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Performance Criteria:

1. Fiber Optic Connector Intermateability Standard (FOCIS) specifications of TIA-604 series.
2. TIA-568.3.

B. Cross-Connects and Patch Panels: Rack mounted, modular fiber panels housing multiple-numbered, duplex cable connectors, adapters, covers and integral cable management.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 40-inch (1 m) lengths.

D. Connector Type:
1. Type SC complying with TIA-604-3.
2. Type LC complying with TIA-604-10.
3. Type MPO complying with TIA-604-5.

E. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of multi and single mode optical fiber cable.
2. Insertion loss not more than 0.25 dB.

F. Jacks and Jack Assemblies:

1. 6 or 12 port, bulkhead (coupler) panels, simplex and duplex; designed for mating of terminated multi and single mode optical fiber cables.
2. Insertion loss not more than 0.25 dB.
3. Designed to snap-in to fiber patch panels.

2.7 SOURCE QUALITY CONTROL

A. Owner shall retain the right to witness required tests. Notify Architect at least 14 days before date of tests and indicate their approximate duration.

B. Testing Administrant: Engage qualified testing agency to evaluate cables.

C. Factory Tests and Inspections:

1. Test and inspect multimode optical fiber cables, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-526-14 and TIA-568.3 before delivering to site. Affix label with name and date of manufacturer's or qualified electrical testing laboratory's certification of system compliance.
2. Test and inspect pre-terminated optical fiber cable assemblies, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-526-14 and TIA-568.3 before delivering to site. Affix label with name and date of manufacturer's or qualified electrical testing laboratory's certification of system compliance.

D. Nonconforming Work:

1. Cables that do not pass tests and inspections will be considered defective.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate backbone cabling with protectors and demarcation point provided by communications service provider.

3.2 SELECTION OF OPTICAL FIBER TYPE

A. Reference drawings for fiber types and strand counts for inter and intra-building backbone connectivity.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Optical fiber backbone cabling systems must provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone and backbone-to-communication system cross-connections.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters may not be used as part of backbone cabling.

C. Comply with BICSI N1, NECA NEIS 1, and NECA NEIS 301.

D. Backbone cabling system must comply with transmission standards in TIA-568.1.

E. Telecommunications Pathways and Spaces: Comply with TIA-569.

F. Wiring Methods:

a. Install plenum cable in environmental airspaces, including plenum ceilings.
b. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

2. In Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

G. Optical Fiber Cabling Installation:

1. Comply with TIA-568.1 and TIA-568.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable may contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30-inch (760 mm) and not more than 6-inch (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before unspooling for installation. Heat lamps may not be used for heating.
9. In communications ER (MDF) and TRs (IDFs) provide a minimum 10-foot (3 m) service loop on each end of cable. and neatly secured in the cable ladder rack or on the equipment backboard.
10. In wall and rack mounted fiber terminals, provide a minimum 3-foot (1 m) service loop (break-out) on each end of cable. Secure service loop with manufacturer-provided cable management inside each wall or rack mounted fiber terminal.
11. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
12. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

H. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable may not be run through building structural members or be in contact with pipes, ducts, or other potentially damaging items.

I. Installation of Cable Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after flooring system has been installed in raised floor areas.
3. Coil cable 6-ft (1.8 m) long not less than 12 inch (300 mm) in diameter below each feed point.

J. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding in accordance with BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607 and NECA/BICSI-607.

C. Bond metallic equipment, including the metallic armoring of OFCR and OFCP optical fiber cables, to grounding bus bar using not smaller than 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: Class 1, Class 2, Class 3 and Class 4.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification must comply with TIA-606 for Class 2, Class 3 and Class 4 level of administration including optional identification requirements of this standard.

C. Cable Schedule: Install in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4-inch (100 mm) of each termination and tap, where it is accessible in cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15-ft (4.5 m).
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use different color for jacks and plugs of each service.

F. Labels must be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect optical fiber jacket materials for qualified electrical testing laboratory certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

    a. Test instruments must meet or exceed applicable requirements in TIA-568.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Multimode backbone link measurements: Test at 850 or 1300 nm in one direction in accordance with TIA-526-14, Method B, One Reference Jumper.

        2) Single mode backbone link measurements: Test at 1310 and 1550 nm in one direction in accordance with TIA-526-14, Method B, One Reference Jumper.

        3) Attenuation test results for backbone links must be less than 2.0 dB. Attenuation test results must be less than those calculated in accordance with equation in TIA-568.1.

B. Nonconforming Work:

1. Cables will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective cables and retest.

C. Collect, assemble, and submit test and inspection reports.

1. Data for each measurement must be documented.
2. Data for field quality-control report submittals must be printed in summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from instrument to computer, saved as text files, and printed and submitted.

END OF SECTION 271323

SECTION 16726 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Selection and installation of communications busbars.
2. Selection and installation of communications bonding conductors.
3. Selection of signal reference grids.
4. Installation of grounding and bonding for towers and antennas.

B. Related Requirements:

1. Section 16750 "Common Work Results for Communications" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 16121 - Grounding

1.2 DEFINITIONS

A. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.

B. PBB: Primary bonding busbar, located in the MDF/ER (main distribution frame/equipment room) and ideally near electrical service entrance.

C. RBB: Rack bonding busbar, located in equipment cabinets and racks.

D. SBB: Secondary bonding busbar, located in IDF/TR (intermediate distribution frame/telecommunication) rooms.

E. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.

F. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.

G. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.

H. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.3 ACTION SUBMITTALS

A. Shop Drawings:

1. For communications equipment room signal reference grid.
2. Include plans, elevations, sections, details, and attachments to other work.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Installing wire connector on conductor.
2. Recommended torque values.

1.5 CLOSEOUT SUBMITTALS

A. Record Documentation: Project record documents in accordance with Section 017839 "Project Record Documents" must include locations of PBB and SBBs, and routing of TBC, TBBs, and BBCs.

PART 2 - PRODUCTS

2.1 See 16121 - Grounding

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

B. Inspect test results of grounding system measured at point of TBC connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of TBC only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF COMMUNICATIONS BUSBARS

A. PBB:

1. Dimensions: ¼ inch thick by 4-inch-high x 12 inch long (6.3 mm thick by 100 mm high by 300 mm).
2. Stand-Off Distance: minimum 2 inch (50 mm).
3. Hole patterns to accommodate two-hole lugs per the recommendation of ANSI/BICSI N3-20 and ANSI/TIA-607 standards.

B. SBB:

1. Dimensions: ¼ inch thick by 2-inch-high x 12 inch long (6.3 mm thick by 50 mm high by 300 mm).
2. Stand-Off Distance: minimum 2 inch (50 mm).
3. Hole patterns to accommodate two-hole lugs per the recommendation of ANSI/BICSI N3-20 and ANSI/TIA-607 standards.

3.3 SELECTION OF COMMUNICATIONS BONDING CONDUCTORS

A. Communications Busbar Connections:

1. TBC: Not smaller than 1/0 AWG for lengths up to 52 ft (16 m) and 3/0 AWG for lengths greater than 52 ft (16 m) and no smaller than largest TBB.
2. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
3. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
4. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
5. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
6. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.

B. Cable Tray Connections:

1. Cable Tray Equipment Grounding Conductor: 6 AWG.
2. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper no smaller than 6 AWG and not longer than 12 inch (300 mm). If jumper is wire, it must be terminated with lug having two holes and long barrel for two crimps. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.

C. Underground Connections: Not smaller than 2 AWG. Provide welded connectors, except bolted connectors may be used in handholes or manholes or as otherwise indicated on Drawings.

3.4 INSTALLATION OF BONDING FOR COMMUNICATIONS

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Busbars:

a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch (300 mm) above finished floor unless otherwise indicated.

b. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

2. Conductors:

   a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
   b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:

      1) Use crimping tool and die that is specific to connector.
      2) Pre-twist conductor.
      3) Apply antioxidant compound to bolted and compression connections.

   c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
   d. Install conductors continuous and without splices.
   e. Support conductors at not more than 36-inch (900 mm) intervals.
   f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.

      1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing that complies with Section 270528 "Pathways for Communications Systems," and bond both ends of raceway to SBB.

3. Provide TBC and terminate ends to PBB and intersystem bonding termination device or busbar at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of NFPA 70.
4. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together BBCs where required by TIA-607.
5. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.
6. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
7. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with NFPA 70; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.
8. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
9. Primary Protector: Bond to PBB with insulated bonding conductor.
10. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located within the same room or space, bond each ground bar of panelboard to SBB.
11. Cable Trays: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
12. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
13. Access Floors: Bond metal parts of access floors to SBB.

3.5 INSTALLATION OF GROUNDING AND BONDING FOR TOWERS AND ANTENNAS

A. Special Techniques:

1. Ring Electrode: Buried at least 30 inch (760 mm) below grade and at least 24 inch (610 mm) from base of tower or mounting.
2. Bond each tower base and metallic frame of dish to ring electrode, buried at least 18 inch (460 mm) below grade.
3. Bond ring electrode and antenna bonding conductors to equipment room PBB or SBB, buried at least 30 inch (760 mm) below grade.
4. Bond metal fences located within 6 ft (1.8 m) of towers and antennas to ring electrode, buried at least 18 inch (460 mm) below grade.
5. Special Requirements for Roof-Mounted Towers:

    a. Roof Ring: Meet requirements for ring electrode except conductors must comply with NFPA 780.
    b. Bond tower base footings steel, SBB in equipment room, and antenna support guys to roof ring.
    c. Connect roof ring to perimeter conductors of lightning protection system.
    d. Coordinate with building lightning protection system.

6. Special Requirements for Waveguides and Coaxial Cable:

    a. Bond cable shields at point of entry into building to nearest SBB and to cable entrance plate, using 2 AWG bonding conductors.
    b. Bond coaxial cable surge arrester to ring electrode or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.6 IDENTIFICATION

A. Comply with Section 16753 "Identification for Communications Systems."

B. Labels must be preprinted or computer-printed type.

1. Label PBB(s) with "TS-PBB," where "TS" is telecommunications space identifier for location of PBB.
2. Label SBB(s) with "TS-SBB," where "TS" is telecommunications space identifier for location of SBB.
3. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.
2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.

a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 mΩ.

1) If measured resistance from electrical service equipment to ground exceeds 5 Ω, notify Architect and include recommendations to reduce resistance to ground.

b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 mΩ.

3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.

a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB and to SBBs. Maximum acceptable AC current level is 1 A.

B. Nonconforming Work:

1. Communications bonding will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

C. Collect, assemble, and submit test and inspection reports.

3.8 PROTECTION

A. After installation, protect busbars and conductors from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

SECTION 16736 - CABLE TRAYS FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

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

B. Provide a complete cable support system comprised of cable tray and cable ladder and as indicated in Project Documents.

C. Provide all necessary materials and labor for the cable support system including supporting/suspension hardware, and miscellaneous accessories resulting in a complete system.

1.2 SUMMARY

A. Section Includes:

1. Ladder cable tray.
2. Wire-mesh cable tray.
3. Cable tray accessories.
4. Warning signs.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment specified is intended as a reference standard for level of quality.

B. Substitutions of equal quality will be accepted. All substitutions are to be approved prior to bid and listed by addenda. Substitutions will not be accepted after the scheduled bid time. Refer to Division 01.

C. Provide materials listed by UL or ETL.

2.2 LADDER CABLE TRAY

A. Specifications

1. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 5052-H32 or Alloy 6061-T6 according to ANSI H 35.1/H 35.1M for fabricated parts.
2. Hardware: Chromium-zinc-plated steel, ASTM F 1136.
3. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
4. Width: 6 inches (150 mm) 9 inches (225 mm) 12 inches (300 mm) 18 inches (450 mm) 24 inches (600 mm) 30 inches (750 mm) 36 inches (900 mm). Refer to plans for dimensions.
5. Minimum Usable Load Depth: 4 inches (100 mm).
6. Straight Section Lengths: 10 feet (3.0 m) 12 feet (3.7 m) 20 feet (6.0 m) 24 feet (7.4 m), except where shorter lengths are required to facilitate tray assembly.
7. Rung Spacing: 6 inches (150 mm) o.c.

8. Radius-Fitting Rung Spacing: 9 inches (225 mm) at center of tray's width.
9. Minimum Cable-Bearing Surface for Rungs: 7/8-inch (22-mm) width with radius edges.
10. No portion of the rungs shall protrude below the bottom plane of side rails.
11. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.
12. Fitting Minimum Radius: 12 inches (300 mm).
13. Class Designation: Comply with NEMA VE 1.
14. Splicing Assemblies: Bolted type using serrated flange locknuts.
15. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

B. Acceptable Manufacturers

1. Chatsworth
2. Eaton (B-Line)
3. Hoffman (nVent)
4. Middle-Atlantic (Legrand)
5. MonoSystems, Inc.
6. Approved equivalent

2.3 WIRE-MESH CABLE TRAY

A. Specifications

1. Materials: Low carbon, passivated, stainless steel, Type 304L or Type 316L, ASTM F 593 and ASTM F 594.
2. Hardware for Stainless-Steel Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.
3. Configuration: Galvanized- steel wire mesh, complying with NEMA VE 1.
4. Width: 6 inches (150 mm) 8 inches (200 mm) 12 inches (300 mm) 16 inches (400 mm) 18 inches (450 mm) 20 inches (500 mm) 24 inches (600 mm) unless otherwise indicated on Drawings.
5. Minimum Usable Load Depth: 4 inches (100 mm).
6. Straight Section Lengths: 10 feet (3.0 m) 12 feet (3.7 m), except where shorter lengths are required to facilitate tray assembly.
7. Structural Performance: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.
8. Class Designation: Comply with NEMA VE 1.
9. Splicing Assemblies: Bolted type using serrated flange locknuts.
10. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

B. Acceptable Manufacturers

1. Chatsworth
2. Eaton (B-Line)
3. Hoffman (nVent)
4. Middle-Atlantic (Legrand)
5. MonoSystems, Inc.
6. Approved equivalent

2.4 CABLE TRAY ACCESSORIES

A. Specifications

1. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
2. Barrier Strips: Same Materials and finishes as for cable tray.
3. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

B. Acceptable Manufacturers

1. Chatsworth
2. Eaton (B-Line)
3. Hoffman (nVent)
4. Middle-Atlantic (Legrand)
5. MonoSystems, Inc.
6. Approved equivalent

2.5 WARNING SIGNS

A. Specifications

1. Comply with requirements for identification in Section 270553 "Identification for Communications Systems."
2. Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel

B. Acceptable Manufacturers

1. Chatsworth
2. Eaton (B-Line)
3. Hoffman (nVent)
4. Middle-Atlantic (Legrand)
5. MonoSystems, Inc.
6. Approved equivalent

2.6 PULL STRING

A. Specifications

1. Application: Light duty cable pulling
2. Special Features: Rot and mildew resistant
3. Tensile Strength: 210 lb.
4. Material: Polypropylene
5. Color: White/Contrasting color

B. Acceptable Manufacturers

1. Ideal Powr-Fish Pull Line. Typical of all interior conduit pathways.
2. Klein Tools 56110 poly pull line
3. Greenlee

2.7 PULL ROPE

A. Specifications

1. Applications: Below grade duct bank
2. Construction: ¼" minimum diameter braided
3. Special Features: Rot and mildew resistant

4. Tensile Strength: 1,125 lb.
5. Material: Polypropylene

B. Acceptable Manufacturer

1. Ideal Pro-Pull Polypropylene Pull Rope. Typical of communications duct banks.
2. Klein Tools
3. Greenlee

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the plans for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

3.2 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to NEMA VE 1.

3.3 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA VE 2.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

F. Fasten cable tray supports to building structure.

G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb (90 kg).

H. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

J. Support bus assembly to prevent twisting from eccentric loading.

K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

L. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

M. Support wire-basket cable trays with trapeze hangers.

N. Support trapeze hangers for wire-basket trays with 3/8-inch diameter rods.

O. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

P. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA VE 2. Space connectors and set gaps according to applicable standard.

Q. Make changes in direction and elevation using manufacturer's recommended fittings.

R. Make cable tray connections using manufacturer's recommended fittings.

S. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems."

T. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

U. Install cable trays with enough workspace to permit access for installing cables.

V. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

W. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

X. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

Y. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
2. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
3. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
4. Check for improperly sized or installed bonding jumpers.
5. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
6. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

SECTION 16744 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

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. Round sleeves.
2. Rectangular sleeves.
3. Sleeve seal systems.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral water stop.

B. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Provide communication sleeves by Hilti, STI, Unique Firestop Products or equivalent.
2. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch (0.6-mm); round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Provide communication sleeves by Hilti, STI, Unique Firestop Products or equivalent.
2. Description:

a. Material: Galvanized sheet steel.
b. Minimum Metal Thickness:

1) For sleeve cross-section rectangle perimeter less than 50-inches (1270 mm) and with no side larger than 16-inches (400 mm), thickness must be 0.052 inch (1.3 mm).
2) For sleeve cross-section rectangle perimeter not less than 50-inches (1270 mm) or with one or more sides larger than 16-inches (400 mm), thickness must be 0.138 inch (3.5 mm).

2.3 SLEEVE SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable or between pathway and cable.

1. Sealing Elements: EPDM and Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel, Fiber-reinforced plastic or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating and Stainless steel of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.6 FOAM SEALANTS

A. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   b. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable, unless sleeve seal system is to be installed or seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 6-inches (150 mm) above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations:

1. Install steel or cast-iron pipe sleeves with integral water stops. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing sleeve seal system. Install sleeve during construction of floor or wall.
2. Install steel pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 16750 – COMMON WORK RESULTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide infrastructure for support of owner furnished and installed Information Communications Technology systems. Owner furnished and installed Information Communication Technology systems may include but are not limited to:
   1. Phone System
   2. Building and Campus Local Area Network(s)

B. The work includes the following as well as work not listed below but described elsewhere, as it applies to all Information Communication Technology systems:

   1. Communications Ducts and Duct Banks
   2. Raceways and Cable Trays
   3. Power Distribution and Control
   4. Telecommunications Grounding and Bonding System
   5. Horizontal Structured Cabling System
   6. Fiber Optic Riser/Backbone System
   7. Communication Room Equipment and Fittings
   8. Communication System Pathways Hangars and Supports
   9. Mass Communication and Clock Systems
   10. Audiovisual System
   11. Permits and inspections per local Authority Having Jurisdiction

C. Interpretation of Contract Documents

   1. This section of the specifications describes infrastructure requirements applicable to Information Communications Technology systems.
   2. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
   3. Mention in these specifications or indications and/or reasonable implications whereby articles, materials, operation or methods related to execution of the work are noted, specified, drawn or described, thereby requires execution of each such item of work and provision of all labor, materials, equipment and accessories required for execution thereof.
   4. No exclusions from, or limitations in, the language used in the specifications shall be interpreted as meaning that the accessories necessary to complete any required system or item of equipment are to be omitted.
   5. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.
   6. Drawings are diagrammatic and indicate general arrangement of system and equipment, except when specifically dimensioned or detailed. They are to show size, capacity, approximate location, direction and general relationship of one work phase to another, but not exact detail or arrangement.
   7. Refer to dimensioned architectural/structural drawings for exact locations of building elements.
   8. Field verification of measurements takes priority over dimensioned drawings.
   9. Dimensions indicated anywhere, are limiting dimensions.
   10. The Owner/User reserves the right to make any reasonable change in location of devices and equipment prior to rough installation without involving additional expense. All such reasonable location changes from the drawings as are necessary to make the work of the Contractor conform to the building as constructed, shall be included and installed without extra cost.

1.2 SCOPE AND RESPONSIBILITY

A. Provide full-time, on-site field representation for Division 27 Information Communication Technology Systems scope of work for duration of installation and prior to turnover.

B. Include detailed scheduling information for Information Communication Technology Cabling Systems installation and testing in the construction schedule. Provide detailed GANTT chart construction schedule showing all tasks referenced in the project phasing plans. Include:

1. Engineering
2. Shop drawing preparation
3. Electrical Work
4. Testing, commissioning, and training.

C. This schedule must be submitted fourteen (14) calendar days after receipt of contract. The duration of this schedule must also comply with the completion dates of the construction schedule contained in the contract documents.

D. Provide coordination to ensure Telecommunication spaces are completed, cleaned and have conditioned air as early as possible to facilitate completion of Information Communication Technology Systems wiring and terminations. Space shall be free of air-borne particles prior to installation of any Information Communication Technology Systems Equipment. The Architect shall inspect and approve the condition of these rooms prior to the installation of any active or passive equipment.

E. Conduct periodic coordination meetings between Contractors to make everyone aware of critical areas of construction. Distribute the meeting minutes and attendance to the Owner/User's Representative, the Architect and the Owner/User in a timely fashion.

F. Contractor shall provide coordination of mechanical and electrical installation requirements with the General Contractor and the Electrical Contractor.

G. Provide coordination of the Owner Furnished and Owner Installed Information Communication Technology Cabling Systems installation.

H. Provide coordination as required to complete the inspection described in paragraph 3.1 INSPECTION.

I. Furnish and install a complete raceway system including conduit, surface raceways, back boxes, junction boxes, mortar boxes, and cable tray for all Information Communication Technology Systems. The conduit size shall allow for a maximum conductor fill of 40% in accordance with NEC guidelines, unless noted otherwise on the drawings.

J. Inspect conduit raceway system including back boxes, junction boxes, and mortar boxes for all Information Communication Technology Cabling Systems furnished by others. Notify the Architect of any discrepancies immediately.

K. Conduit and surface raceways from telecommunications outlets shall continue from box to location above the nearest, accessible ceiling space.

L. Furnish and install all nonstandard back boxes.

M. Furnish all 120-volt AC wiring and connections for power panels and/or terminal strips in electrical panels, cabinets, enclosures, and or consoles, as indicated in the contract documents and approved shop drawings.

N. Furnish and install all devices, equipment, and appurtenances resulting in complete, functional, and fully operational systems as specified herein and indicated on the drawings.

O. Prior to fabrication, coordinate exact location and installation of devices with other trades.

P. Provide coordination to complete the inspection described in Paragraph 3.1 INSPECTION.

Q. Coordinate the work of this Section with that of other Sections to ensure that the entire work of this project will be carried out in an orderly, complete and coordinated fashion.

1.3 RELATED DOCUMENTS

A. General

1. Drawings, specifications and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section. The Contractor and all subcontractors are responsible for locating information pertaining to required items of work specified or indicated elsewhere in the Contract Documents.

B. Related Work Specified Elsewhere

1. Division 01 - GENERAL REQUIREMENTS
2. Division 16 – ELECTRICAL

C. Reference Specifications, Materials, and/or Codes

1. Submit all items necessary to obtain all required permits to the appropriate Regulatory Agencies obtain all required permits and pay all required fees.
2. All work shall conform to the National Electrical Code (NEC) and to applicable National Fire Protection Association (NFPA) codes.
3. All work shall conform to all Federal, State and local ordinances.
4. Where applicable, all fixtures, equipment and materials shall be as approved or listed by the following:

    a. Factory Mutual Laboratories (FM).
    b. Underwriters Laboratories, Inc. (UL).
    c. National Electrical Manufacturers Association (NEMA).

5. References to the National Electrical Code and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and specification sections shall govern in those instances where requirements are greater than those specified in the NEC and NFPA.
6. All material and equipment shall be listed, labeled or certified by Underwriters' Laboratories, Inc. where such standards have been established. Equipment and material which are not covered by the UL Standard, will be accepted provided equipment and material are listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class, which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe will be considered, if inspected or tested in accordance with national industrial standards such as NEMA, ICEA or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings. NOTE: It is not required that the final installed system be UL listed as a single product.

D. All work shall meet or exceed the standards and procedures of the following:

1. National Fire Protection Association (NFPA): NFPA 70, NFPA 72, NFPA 90A
2. National Electrical Code (NEC)
3. National Electrical Contractors Association (NECA)
4. National Electric Manufacturers Association (NEMA)
5. American National Standards Institute (ANSI)
6. Telecommunications Industry Association (TIA):

    a. 568 Commercial Building Telecommunications Cabling Standard (latest revision).

    b. 569 Commercial Building Standard for Telecommunications Pathways and Spaces (latest revision).

    c. 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings (latest revision).

    d. 607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

7. National Electrical Manufacturers Association (NEMA)
8. American Society of Testing Materials (ASTM)
9. Institute of Electronic & Electrical Engineers (IEEE)
10. Underwriters Laboratory (UL)
11. Americans With Disabilities Act (ADA)
12. Building Industry Consulting Service International (BICSI)

E. Include all items of labor and material required to comply with such standards and codes. Where quantity, sizes or other requirements indicated on the drawings or herein specified are in excess of the standard or code requirements, the specifications or drawings, respectively, shall govern.

F. Installation shall be performed in accordance with the applicable standards, requirements and recommendations of the current local codes and any additional authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. General

1. Furnish and install only new equipment and materials required (less than 1 year from manufacture), unused without blemish or defect.
2. Each major component of equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. NEMA Code Ratings, UL label, or other data, which is die-stamped into the surface of the equipment, shall be stamped in a location easily visible. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance. In many cases, equipment is oversized to allow for pickup loads which cannot be delineated under the minimum performance.
3. All equipment of the same type shall be the product of one manufacturer.
4. The original factory condition of manufactured equipment shall not be modified without the written approval of the Architect.

1.5 SUBMITTALS

A. Duplicate copies of the bidding documents are not acceptable and will be rejected.

B. The formal submittal shall be transmitted 30 days after award of contract.

C. Submit electronic submittals via email as PDF electronic files.

D. Product Submittal

1. Submittal must consist of a complete package including Bill of Material, Product Data for each Section of the Division 27 Cable Tray Systems, and Shop Drawings as applicable. PARTIAL OR INCOMPLETE SUBMITTALS ARE NOT ACCEPTABLE. The Submittal shall include the following:

   a. A Title Page complete with the following required information:

      1) Project name.
      2) Date.
      3) Name and address of the Architect.
      4) Name of Construction Manager
      5) Name and address of the Electrical Contractor
      6) Name and address of the General Contractor
      7) Name and address of any Subcontractors.

   b. An Index Page complete with the following required information:

      1) Name of the Supplier.
      2) Name of the Manufacturer.
      3) Title, section and paragraph of the Specification Sections. (Example section 271500, paragraph 2.4)
      4) Products in order as specified in PART II of the related specification.

   c. Bill of Materials

      1) Provide complete bill of materials for all major components, accessories, and hardware to be provided in order to assemble a complete functioning system.
      2) Bill of materials shall include-

         i) Manufacturer Name
         ii) Model
         iii) Version
         iv) Quantity

   d. Each Specification section shall be separated, collated in order, and complete with the following information:

      1) Title sheet.
      2) Descriptive purpose of the system, stating how each product is to function.

   e. Each Data Sheet shall have the specific reference to the Specification it is to be used for, noting the section and paragraph.

   f. Product Data showing multiple products, models or options shall be clearly marked identifying the specific product, model and options, which are submitted for review. Unmarked submittals or facsimile copies shall not be acceptable.

   g. Submit product data for all equipment showing:

      1) Original Data Sheets Only.
      2) Product performance, mechanical and electrical specifications.

3) Manufacturer's installation instructions.
4) Certification from the submitted manufacturers that the Contractor's designated personnel are trained on the installation of the system. Include Contractor installer's name, experience and responsibility.
5) Product test compliance certificates if required.

E. Shop Drawings

1. Contract documents are diagrammatic in nature and intended to define the general scope and complexity of the systems. They do not reflect the detail necessary to construct the specified system. Assembly and submission of detailed shop drawings are required.
2. Submittals consisting of reproduced copies of the original bidding documents will be rejected. The contractor is required to develop a complete set of drawings specific to the final configuration of the system based on the manufacture and models of all components included. Shop drawings are to include all changes noted in addenda, as well as any changes included in architect's special instructions or change orders issued prior to the submittal of the shop drawings.
3. Shop drawings shall be submitted with product data.
4. All drawings shall be created using an industry recognized computer aided design program. Recognized programs include AutoDesk Revit, AutoCAD, and Microstation. All drawings are to be made using the latest software release available.
5. Submit shop drawings for all equipment showing:

a. Location and type of all field equipment on floor plans. Include all device revisions from addenda.

1) Conduit Routing
2) Cable Tray Routing
3) Wall Penetrations for Conduit, Tray, and Sleeves

b. Size and spacing of all anchors, wall penetrations, joinery construction, etc., required for complete system installation.
c. Electrical riser diagrams which identify all signal, power, and ground circuitry. Identify circuit numbers corresponding with electrical drawings.
d. Telecommunication Backboard layouts including wall mounted equipment, equipment ladders, ground bus bar mounting, wall penetrations, cable routing, and cable support methods.

F. Record Documents

1. Provide Record Documents for each Division 27 section.
2. Records shall be submitted in both paper and electronic format.
3. Provide one (1) set of black line prints.
4. Record documents shall detail "As-built" condition of all systems including:

a. A set of updated shop drawings showing all Contract changes.
b. A set of updated product data showing all Contract changes.
c. Cable tray routing and installation.
d. Electronic copy shall use the most recent version of the software platform used for creating shop drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Products that have been in manufacture for at least one year, unless otherwise specified by performance requirements.

2.2 SUBSTITUTIONS

A. Deviations from specifications

1. Any deviations from the specifications must be approved 10 calendar days prior to the bid date. This includes changes to the scope of work, equipment substitutions, and changes to the general provision.
2. Changes to the scope of work in the bid proposal are not acceptable. Any proposed change is to be submitted to the Architect for review. Any approved scope changes will be listed by addendum prior to the bid opening.
3. Any proposed equipment substitution must be submitted 10 calendar days prior to the bid date. Accompanying the request, the Contractor must provide manufacturer's product specifications for the exact model be substituted. This literature must clearly state all specifications called for in the bidding documents, as well as performance characteristics not specified but inherent to the product listed in the specifications. Any items approved as a substitute will be listed by addendum prior to the bid opening. Substitutions after the award of bid will only be allowed in case of discontinued equipment, or if an item of equal or better quality is available and will not affect the contract cost of the system.
4. Changes to the general provisions are not acceptable. Any proposed change is to be submitted to the Architect for review. Any approved changes will be listed by addendum prior to the bid opening.
5. When a specified item is found to be discontinued or obsolete by the manufacturer, the contractor is required to substitute the manufacturer recommended equivalent for that product. If an equivalent is not available, the contractor is instructed to notify the Architect in writing prior to bid time.

B. Where specific products may be sole source specified, no substitutions will be allowed.

2.3 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are readily available.

2.4 EQUIPMENT IDENTIFICATION

A. All back boxes shall be labeled according to their intended use.

B. Pull strings shall be labeled on both ends with a unique identifier.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that all equipment is installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

B. In the event of discrepancy, immediately notify the Architect.

C. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

D. Return to original (preconstruction) condition any work disturbed during system installation.

3.2 INSTALLATION

A. Install all equipment in strict accordance with the manufacturer's recommendations, reviewed shop drawings, BICSI TDMM, latest/most current edition and TIA Standards for UTP and fiber optic cable.

B. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions, unless indicated otherwise.

C. Secure equipment with fasteners suitable for the use, materials, and loads encountered. If requested, submit evidence proving suitability. Do not attach electrical materials to roof decking, removable or knockout panels, or temporary walls and partitions, unless indicated otherwise.

D. National Electrical Code requirements are applicable to all work.

E. Working spaces (clearances) shall be not less than specified in the National Electrical Code for all voltages specified.

F. Where the Architect determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner/User. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.

G. All new cable pathways using cable ladders, trays raceways or conduits must be designed and installed to be at 40% or less of maximum fill capacity.

H. During construction, temporarily support all communications cable bundles in ceiling spaces of the MDF/ER and IDFs/TRs to avoid and minimize damage to cables prior to final termination. Cable bundles shall not be allowed to hang from ceiling spaces down to the floor during construction except on a daily basis where contractor is actively placing, pulling and tagging communications cabling.

I. Plywood backboards will be used on the walls of the Equipment and Telecommunication Rooms.
   1. Hardwood, ¾-inch x 4-ft x 8ft.
   2. Type A/C with smooth side installed to interior spaces and long dimension installed vertically.
   3. Fire retardant with factory-applied, indelible stamping that indicates fire treated rating.
   4. Painted with two coats of white or very light color latex paint. DO NOT paint over one or more of the factory stampings, which shall be in a conspicuous and inspectable location on each backboard.
   5. Free of defects (knots and voids shall be considered a defect).
   6. Properly secured to walls as indicated on drawings.
   7. Mechanically secured with approved anchors to ensure equipment support rating of 50 pounds per linear foot of wall space.

3.3 WORK PERFORMANCE

A. Coordinate location of equipment with other trades to minimize interferences.

B. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills shall not be allowed, except where permitted by the Architect as required by limited working space.

C. Holes shall not affect structural sections such as ribs or beams.

D. Holes shall be laid out in advance. The Architect shall be advised prior to drilling through structural sections for determination of proper layout.

E. Any holes created in walls, floors, or ceilings by the Contractor are to be sealed with fire rated systems and methods according to all national, state, and local codes.

F. Hangers and other supports shall support only equipment and materials. Provide not less than a safety factory of 1.5, which shall conform to any specific requirements in the Construction Documents.

G. The Contractor is responsible for repairing and or replacing any damage caused by their workforce at no additional cost to the Owner/User, or the Owner/User's representatives.

3.4 PROTECTION AND CLEANING OF SYSTEMS AND EQUIPMENT

A. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.

B. Prevent damage from rain, dirt, sun and ground water by storing equipment on elevated supports and covering all sides with securely fastened protective rigid or flexible waterproof coverings.

C. Protect piping by storing it on elevated supports and capping the ends with suitable closure material to prevent dirt accumulation in the piping.

D. During construction, cap the top of all conduits and raceway installed vertically.

E. During installation, protect equipment against entry of foreign matter on the inside, and vacuum clean both inside and outside before testing and operating.

F. Damaged equipment, as determined by the Architect, shall be replaced.

G. Protect painted surfaces with removable heavy kraft paper, sheet vinyl or equal, installed at the factory and removed prior to final inspection.

H. Repaint damaged "FINISH" paint on equipment and materials with painting equipment and finished with same quality of paint and workmanship as used by the original manufacturer so repaired areas are not obvious.

I. Conduit back boxes, floor boxes, and poke thru's shall be vacuumed clean prior to the placement of communications cables.

J. Outside plant (underground) ducts and conduits shall be vacuumed and/or rodded and swabbed to remove foreign matter, water, mud, etc., prior to placement of communications cables.

3.5 LABELING

A. Power Outlets

1. Power outlet labels shall be machine-generated.
2. All power outlets designated for equipment shall be labeled on top.
3. Provide a second label on the bottom of the outlet cover plate indicating service panel number and circuit breaker number.
4. Text lettering to be 1/8" high.

B. Communications
   1. Communications cable, device, fixture, equipment and outlet labels shall be machine-generated. Hand labeling will not be acceptable.
   2. Labeling schema shall be Owner-approved prior to final or permanent labeling.
   3. Labels shall be generated using a white background with black alpha-numeric characters.
   4. Cable jacket labels shall be self-laminating, wrap type and shall be placed within 6-inches of the termination point at each end.
   5. Final, approved labeling shall correspond with system as-built drawings.

3.6 CLEANING

A. On a daily basis during construction and prior to Owner/User acceptance of the building, remove from the premises and dispose of all packing material and debris caused by work performed under Division 27 Information Communication Technology Cabling Systems specifications.

B. Remove all dust and debris from interiors and exteriors of electrical equipment, equipment room cabinets, racks and enclosures. Clean accessible current carrying elements prior to being energized.

C. Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and the like and leave the premises clean, neat and orderly.

D. All bright metal or plated work shall be thoroughly polished. All pasted labels, dirt and stains shall be removed from the devices.

END OF SECTION

SECTION 16753 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Underground-line warning tape.
4. Signs.
5. Cable ties.
6. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Labels.
2. Bands and tubes.
3. Underground-line warning tape.
4. Signs.
5. Cable ties.
6. Miscellaneous identification products.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

C. Provide samples for each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products if so requested.

D. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation (labeling schema).
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation (labeling schema).
3. Racks: Scaled drawings indicating location and proposed designation (labeling schema).
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations (labeling schema).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Machine-generated, adhesive, tape style labels shall contain black letters on a white field.
2. Engraved phenolic (lamacoid style) labels shall contain white letters on a black field.
3. Provide labels for all racks, cabinets and enclosures.
4. Install labels on highest, centered location of each rack, cabinet and enclosure.

B. Cable Identification Labels:

1. Machine-generated, adhesive, self-laminating wrap style cable jacket labels shall contain black letters on a white field.
2. Apply cable jacket labels within 6-inches of termination point at each end.
3. Cable jacket labels shall correspond to the approved labeling schema and to the as-built documentation.

C. Patch Panel Labels:

1. Machine-generated, adhesive, tape style labels shall contain black letters on a white field.
2. Engraved phenolic (lamacoid style) labels shall contain white letters on a black field.
3. Provide labels for every termination patch panel, copper and fiber.
4. Install patch panel labels on highest, left-most location of each panel.
5. Patch panel labels shall correspond to the approved labeling schema and to the as-built documentation.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, polyester or vinyl flexible labels with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels:
   a. Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Minimum Nominal Size:

   a. 1-1/2 by 6-inches (37 by 150 mm) for raceway and conductors.
   b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
   c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL-FIBER CABLE".

C. Tag, Nonconducting Polyolefin: Type I:

1. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3-inches (75 mm).
3. Thickness: 4 mils (0.1 mm).
4. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
5. Tensile According to ASTM D882: 30 lbf (133.4 N) and 2500 psi (17.2 MPa).

D. Tag, Nonconducting Multilayer Laminate: Type II:

1. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3-inches (75 mm).

3. Thickness: 12 mils (0.3 mm).
4. Weight: 36.1 lb/1000 sq. ft. (17.6 kg/100 sq. m).
5. Tensile According to ASTM D882: 400 lbf (1780 N) and 11,500 psi (79.2 MPa).

E. Tag, Detectable: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3-inches (75 mm).
3. Overall Thickness: 5 mils (0.125 mm).
4. Foil Core Thickness: 0.35 mil (0.00889 mm).
5. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
6. Tensile According to ASTM D882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).

F. Tag, Detectable, reinforced: Type IID:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Width: 3-inches (75 mm).
3. Overall Thickness: 8 mils (0.2 mm).
4. Foil Core Thickness: 0.35 mil (0.00889 mm).
5. Weight: 34 lb/1000 sq. ft. (16.6 kg/100 sq. m).
6. Tensile According to ASTM D882: 300 lbf (1334 N) and 12,500 psi (86.1 MPa).

2.6 SIGNS

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, high-intensity reflective, pre-punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Metal-Backed Butyrate Signs:
1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 10 by 14-inches (250 by 360 mm).

C. Laminated-Acrylic or Melamine-Plastic Signs:
1. Engraved Legend: with white letters on black face or white letters on a dark gray background.
2. Thickness:

a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.

3. Attachment: Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting or Self-adhesive.

4. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) According to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) According to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) According to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Maroon/Burgundy.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6-inches (150 mm) from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6-inches (150 mm) from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6-inches (150 mm) from cable end.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2-inches (50 mm) high.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. Underground-Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8-inches (150 to 200 mm) below finished grade. Use

multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16-inches (400 mm) overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.
3. Faceplate number.

E. Modular Jack Inserts (User end): Each modular jack insert shall be labeled. Label shall be placed under the clear, acrylic label window of each faceplate. Each modular jack shall be labeled with its individual, sequential designation composed of the following, in the order listed:
1. Patch panel designator.
2. Individual patch panel port number designator.

F. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
2. Patch Panels: Label individual patch panels in each rack, starting at top and working down, with self-adhesive labels.
3. Patch panel ports (individual data outlets): Label each outlet with a self-adhesive label indicating the following, in the order listed:

    a. Room number being served.
    b. Colon.
    c. Faceplate number.

G. Backbone Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

H. Horizontal Cables: Label each cable with a vinyl-wraparound label or self-adhesive wraparound label indicating the following, in the order listed:

1. Room number.
2. Colon.
3. Faceplate number.

I. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

J. Instructional Signs: Self-adhesive labels.

K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Self-adhesive labels, Baked-enamel warning signs or Metal-backed, butyrate warning signs.

1. Apply to exterior of door, cover, or other access.

L. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label, Baked-enamel signs, Metal-backed butyrate signs, Laminated-acrylic or melamine-plastic sign.
2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign, Stenciled legend 4 inches (100 mm) high].
3. Equipment to Be Labeled:

a. Communications cabinets and racks.
b. Uninterruptible power supplies.
c. Computer room air conditioners.
d. Power distribution components.
e. Communications grounding/bonding bus bars

END OF SECTION

PRE-CONSTRUCTION CONFERENCE CHECK-LIST

Project: **Baseball and Softball Complex Renewal for Gadsden State Community College**

Funding: **Local / ACCS**

Location: **TBD**

Date/Time: **TBD**

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.

8. **Cost Breakdown and Progress schedule.**
   Cost breakdown and progress schedule must be submitted and approved on proper ACCS 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.**
   Five original sets are required. Architect will verify, sign and forward to Owner.

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 <u>ALL</u> Change Order Requests submitted:

a. Each material number shall include an invoice / quote listing unit quantities, 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 <u>CANNOT</u> be prepared if all backup paperwork is not 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. <u>Digital Copies</u>: 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 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 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 schedule inspection. If an inspection is cancelled, it will be rescheduled subject to the Inspector's availability.
- If an inspection is cancelled less than 48 hours prior to the schedule 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, 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 Inspector
    - ✓ Grease duct must be inspected and approved by the 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, City Inspector
  - Inspection Requirements:
    - ✓ Fire alarm certification
    - ✓ Kitchen hood fire suppression system certification

- ✓ General Contractor's 5-Year Roofing Warranty (ACCS Form 6-L)
- ✓ Roofing manufacturer's guaranty
- ✓ Emergency and exit lighting tests
- ✓ Fire alarm must be monitored
- ✓ **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 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 and GC. Architect will fill in all blanks on the field report form.

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)

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. that is 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 will be at 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. **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.**

48. **G.C. is to have copies of all required roofing warranties in hand at the final inspection.** i.e. Manufacturers' and 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.

49. **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.

50. **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.

51. **Certificate of Substantial Completion.**
Architect will provide at the final inspection, provided contractor has copies of all roof warranties and the fire alarm certification.

52. **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'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)

53. **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.

54. 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).

55. 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.

56. 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.

57. 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.

58. Miscellaneous: