PROJECT MANUAL

NEW ISTC BUILDING AT PERRY COUNTY CORRECTIONAL FACILITY for J.F. INGRAM STATE TECHNICAL COLLEGE

Uniontown, Alabama

for the

ALABAMA COMMUNITY COLLEGE SYSTEM

Montgomery, Alabama

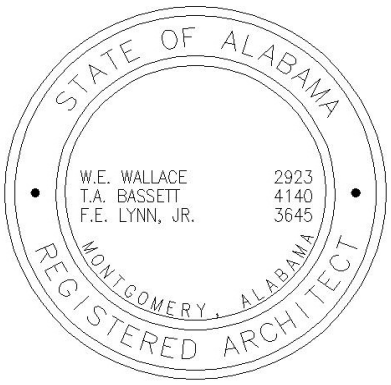
ACCS Project No. 2022 094 ISTC

September 27, 2024

FINAL SET

Prepared By

Goodwyn Mills Cawood, LLC
2660 EastChase Lane, Suite 200
Montgomery, AL 36117
T 334.271.3200
www.gmcnetwork.com



GMC PROJECT NUMBER: AMGM240006

OWNERSHIP OF DOCUMENTS AND DISCLAIMER

The Project Manual, Technical Specifications, Drawings, and all other documents relating to this project have been prepared for this individual and particular project, and for the exclusive use of the original Owner, developer or other party so indicated.

Actual project conditions and as-built conditions may vary significantly. Changes made during bidding, negotiations, construction, due to additions or deletions of portions of this project, and/or for other reasons, may not be indicated in these documents.

These documents may not be used or relied upon as a certification of information indicated, or used for any other project, by any third parties or other parties, for any purpose whatsoever, without the prior written consent of Goodwyn Mills Cawood, LLC, or prior to receipt of mutually agreed to compensation paid to Goodwyn Mills Cawood, LLC, therefor.

The ownership, copyrights, and all other rights to these documents, are reserved by Goodwyn Mills Cawood, LLC, including in part, all copies thereof in any form or media. Reproduction of the material contained in these documents or substantial quotation of their provisions without prior written permission of Goodwyn Mills Cawood, LLC, violates the copyright and common laws of the United States and will subject the violator to legal prosecution.

Goodwyn Mills Cawood, LLC
Post Office Box 242128
Montgomery, AL 36124-2128
and
Birmingham, Alabama
Mobile, Alabama
Andalusia, Alabama
Vernon, Alabama
Eufaula, Alabama
Huntsville, Alabama
Fairhope, Alabama
Foley, Alabama
Atlanta, Georgia
Albany, Georgia
Augusta, Georgia
Savannah, Georgia
Columbia, South Carolina
Greenville, South Carolina
Nashville, Tennessee
Pensacola, Florida
Sarasota, Florida
Auburn, Alabama
Daphne, Alabama

PROJECT DIRECTORY

OWNER:

ALABAMA COMMUNITY COLLEGE SYSTEM
Montgomery, Alabama
and
INGRAM STATE TECHNICAL COLLEGE
5375 Ingram Road
Deatsville, AL 36022
Phone: (334) 285-5177
FAX: (334) 285-5328
Ms. Annette Funderburk - President

ARCHITECT, CIVIL AND ELECTRICAL ENGINEERS:

GOODWYN MILLS CAWOOD, LLC
2660 Eastchase Lane, Suite 200
Montgomery, Alabama, 36117
Phone: (334) 271-3200
FAX: (334) 272-1566
Freddie E. Lynn, Jr., AIA, Project Architect
Hillary Morgan, AIA, Project Manager
Mike Swinson, CSI, Project Manual
Craig Sanford, PE, (Civil)
John Averrett, PE (Electrical)

STRUCTURAL ENGINEER:

BLACKBURN, DANIELS & O'BARR, INC.
8805 County Road 40 East
Lowndesboro, Alabama 36752-0100
Phone: (334) 265-0206
FAX: (334) 265-0207
Jack Daniels, PE (Structural)

MECHANICAL ENGINEER:

MW/DAVIS DUMAS & ASSOCIATES, INC.
4500 Southlake Park, Suite 200
Hoover, Alabama 35244
Phone: (205) 252-0246
FAX: (334) 269-1559
D. Sammy Davis, PE (Mechanical)

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS FOR PROJECT MANUAL

INTRODUCTORY INFORMATION

PROJECT DIRECTORY
TABLE OF CONTENTS FOR PROJECT MANUAL

BIDDING REQUIREMENTS:

INVITATION FOR BIDS
INSTRUCTIONS TO BIDDERS ACCS FORM 5-C
SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
PROPOSAL FORM ACCS FORM 5-E
ATTACHMENT A TO PROPOSAL FORM - UNIT PRICES
ATTACHMENT B TO PROPOSAL FORM - LIST OF SUBCONTRACTORS
ATTACHMENT C TO PROPOSAL FORM - ACCOUNTING OF SALES TAX ACCS FORM 5-H
FORM OF BID BOND ACCS FORM 5-F

CONTRACT FORMS:

CONSTRUCTION CONTRACT FORM ACCS FORM 2-A
PERFORMANCE BOND FORM ACCS FORM 2-C
PAYMENT BOND FORM ACCS FORM 2-D

GENERAL CONDITIONS:

GENERAL CONDITIONS OF THE CONTRACT ACCS FORM 2-B
GENERAL CONTRACTOR'S ROOFING GUARANTEE ACCS FORM 6-L
FORM OF APPLICATION AND CERTIFICATE FOR PAYMENT ACCS FORM 6-D
FORM OF SCHEDULE OF VALUES ACCS FORM 6-E
FORM OF INVENTORY OF STORED MATERIALS ACCS FORM 6-F
FORM OF PROGRESS SCHEDULE AND REPORT ACCS FORM 6-H
FORM OF CHANGE ORDER JUSTIFICATION ACCS FORM 2-G
FORM OF CONTRACT CHANGE ORDER ACCS FORM 2-F
FORM OF CERTIFICATE OF SUBSTANTIAL COMPLETION ACCS FORM 6-K
FORM OF ADVERTISEMENT OF COMPLETION ACCS FORM 6-M
CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS ACCS FORM 6-N
CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS ACCS FORM 6-P
CONSENT OF SURETY TO FINAL PAYMENT ACCS FORM 6-Q
CERTIFICATION OF STRUCTURAL OBSERVATIONS ACCS FORM 6-J
DETAIL OF PROJECT SIGN
IMMIGRATION STATUS VERIFICATION
(**DUE along with Proposal Form on Bid Date;** *"E-Verify Memorandum of Understanding"*)
FORM OF DISCLOSURE STATEMENT
(to be executed along with Construction Contract only)
ELECTRONIC FILE CONVERSION AND TRANSFER AGREEMENT

TECHNICAL SPECIFICATIONS:

DIVISION 1 - GENERAL REQUIREMENTS:

SECTION 01010 - "SUMMARY OF WORK"
SECTION 01015 - "SPECIAL CONDITIONS"
Form A Contractor's Information for Background Check
SECTION 01020 - "ALLOWANCES"
SECTION 01026 - "UNIT PRICES"
SECTION 01045 - "CUTTING AND PATCHING"
SECTION 01061 - "REGULATORY REQUIREMENTS AND TAX EXEMPTIONS"
SECTION 01095 - "REFERENCED STANDARDS AND DEFINITIONS"
SECTION 01500 - "TEMPORARY FACILITIES"
SECTION 01700 - "PROJECT CLOSEOUT"
SECTION 01720 - "PROJECT RECORD DOCUMENTS"
SECTION 01732 - "SELECTIVE DEMOLITION"

DIVISION 2 - EXISTING CONDITIONS:

SECTION 02010 - "SUBSURFACE INVESTIGATION"
ATTACHED "REPORT OF GEOTECHNICAL EXPLORATION"
SECTION 02110 - "SITE CLEARING"
SECTION 02200 - "EARTHWORK"
SECTION 02250 - "EROSION AND SEDIMENTATION CONTROLS"
SECTION 02282 - "TERMITE CONTROL"
SECTION 02511 - "HOT-MIXED ASPHALT PAVING"
SECTION 02515 - "FACILITY FIRE SUPPRESSION WATER-SERVICE PIPING"
SECTION 02520 - "PORTLAND CEMENT CONCRETE PAVING"
SECTION 02580 - "PAVEMENT MARKING"
SECTION 02668 - "WATER SERVICE PIING"
SECTION 02720 - "STORM DRAINAGE"
SECTION 02730 - "SANITARY SEWERAGE"
SECTION 02900 - "LANDSCAPE WORK"

DIVISION 3 - CONCRETE:

SECTION 03300 - "CONCRETE"

DIVISION 4 - MASONRY:

SECTION 04200 - "UNIT MASONRY"

DIVISION 5 - METALS:

SECTION 05120 - "STRUCTURAL STEEL"
SECTION 05210 - "STEEL JOISTS"
SECTION 05310 - "STEEL DECK"
SECTION 05400 - "COLD-FORMED METAL FRAMING"
SECTION 05500 - "METAL FABRICATIONS"

DIVISION 6 - WOOD AND PLASTICS:

SECTION 06100 - "ROUGH CARPENTRY"

DIVISION 7 - THERMAL AND MOISTURE PROTECTION:

SECTION 07210 - "BUILDING INSULATION"
SECTION 07270 - "FIRESTOPPING"
SECTION 07600 - "FLASHING AND SHEET METAL"
SECTION 07900 - "JOINT SEALERS"

DIVISION 8 - DOORS AND WINDOWS:

SECTION 08110 - "STEEL DOORS AND FRAMES"
SECTION 08211 - "FLUSH WOOD DOORS"
SECTION 08410 - "ALUMINUM ENTRANCES AND STOREFRONTS"
SECTION 08710 - "FINISH HARDWARE"
SECTION 08800 - "GLASS AND GLAZING"

DIVISION 9 - FINISHES:

SECTION 09250 - "GYPSUM DRYWALL"
SECTION 09511 - "ACOUSTICAL PANEL CEILINGS"
SECTION 09650 - "RESILIENT FLOORING"
SECTION 09900 - "PAINTING"

DIVISION 10 - SPECIALTIES:

SECTION 10100 - "VISUAL DISPLAY BOARDS"
SECTION 10165 - "TOILET PARTITIONS"
SECTION 10800 - "TOILET AND BATH ACCESSORIES"

DIVISION 11 - EQUIPMENT:

SECTION 11191 - "SECURITY FENCING"

DIVISION 12 - FURNISHINGS:

NOT REQUIRED

DIVISION 13 - SPECIAL CONSTRUCTION:

SECTION 13122 - "PRE-ENGINEERED METAL BUILDING SYSTEMS"

DIVISION 14 - CONVEYING SYSTEMS:

NOT REQUIRED

DIVISION 15 - MECHANICAL:

SECTION 15050 - "GENERAL HVAC REQUIREMENTS"
ATTCHMENT "A" TO SECTION 15050
SECTION 15052 - "COMMON WORK RESULTS FOR PLUMBING"
SECTION 15061 - "HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT"
SECTION 15062 - "HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT"
SECTION 15076 - "IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT"
SECTION 15077 - "IDENTIFICATION FOR HVAC PIPING & EQUIPMENT"
SECTION 15082 - "PLUMBING INSULATION"
SECTION 15086 - "DUCT INSULATION"
SECTION 15088 - "PIPING INSULATION"
SECTION 15111 - "GENERAL-DUTY VALVES FOR PLUMBING PIPING"
SECTION 15126 - "METERS AND GAGES FOR PLUMBING PIPING"
SECTION 15140 - "DOMESTIC WATER PIPING"
SECTION 15145 - "DOMESTIC WATER PIPING SPECIALTIES"
SECTION 15150 - "SANITARY WASTE AND VENT PIPING"
SECTION 15155 - "SANITARY WASTE PIPING SPECIALTIES"
SECTION 15183 - "REFRIGERANT PIPING"
SECTION 15410 - "PLUMBING FIXTURES"
SECTION 15485 - "ELECTRIC WATER HEATERS"
SECTION 15671 - "OUTDOOR HEAT PUMPS"
SECTION 15725 - "INDOOR HEAT PUMP UNITS"
SECTION 15739 - "DUCTLESS SPLIT-SYSTEM AIR CNDITIONING UNITS"
SECTION 15815 - "METAL DUCTS"
SECTION 15820 - "DUCT ACCESSORIES"
SECTION 15838 - "HVAC POWER VENTILATORS"
SECTION 15855 - "DIFFUSERS, REGISTERS, AND GRILLES"
SECTION 15900 - "HVAC INSTRUMENTATION AND CONTROLS"
SECTION 15940 - "SEQUENCE OF OPERATION"
SECTION 15950 - "HVAC TESTING, ADJUSTING, AND BALANCING"

DIVISION 16 - ELECTRICAL:

SECTION 16000 - "ELECTRICAL"
SECTION 16050 - "GENERAL ITEMS"
SECTION 16060 - "GROUNDING AND BONDING"
SECTION 16073 - "HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS"
SECTION 16075 - "ELECTRICAL IDENTIFICATION"
SECTION 16120 - "CONDUCTORS AND CABLES"
SECTION 16130 - "RACEWAYS AND BOXES"
SECTION 16140 - "WIRING DEVICES"
SECTION 16211 - "ELECTRICAL METERING"
SECTION 16289 - "TRANSIENT VOLTAGE SUPPRESSION"
SECTION 16410 - "ENCLOSED SWITCHES AND CIRCUIT BREAKERS"
SECTION 16442 - "PANELBOARDS"
SECTION 16491 - "FUSES"
SECTION 16512 - "LED LIGHTING"
SECTION 16710 - "STRUCTURED CABLING SYSTEM"
SECTION 16721 - "FIRE ALARM SYSTEM"
SECTION 16910 - "OCCUPANCY SENSORS"
SECTION 16951 - "CCTV SURVEILLANCE SYSTEM"

END OF TABLE OF CONTENTS FOR PROJECT MANUAL

THIS PAGE INTENTIONALLY LEFT BLANK

ADVERTISEMENT FOR PREQUALIFICATION OF CONTRACTORS AND FOR BIDS FROM BIDDERS THAT ARE PREQUALIFIED

Prequalification Proposals from General Contractors shall be submitted to Goodwyn Mills Cawood, LLC on behalf of the Owner electronically to the attention of Missy Lee at missy.lee@gmcnetwork.com: **UNTIL 4:00 PM LOCAL TIME; ON , 2024**, for:

NEW ISTC BUILDING AT
PERRY COUNTY CORRECTIONAL FACILITY
FOR JF INGRAM STATE TECHNICAL COLLEGE
UNIONTOWN, ALABAMA
(Local Funds)

and thereafter delivered to the Owner for consideration of approval to bid this project. Prequalification proposal requirements may be obtained from the Architect, by written request on the Contractor's company letterhead. Prequalified Bidders will be notified in writing IF NOT APPROVED. Bid and Construction Documents will be available to bidders, currently anticipated to be on or about Monday, February 6, 2023.

The Owner reserves the right to reject any or all proposals, to waive technical errors, and/or abandon this process if, in their judgment, the best interests of the Owner will thereby be promoted.

Sealed proposals will be received only from Prequalified General Contractor Bidders by the JF Ingram State Technical College at their offices at 5375 Ingram Road; Deatsville, Alabama, 36022; **AT 2:00 PM CST ON , 2024** at which time and place they will be publicly opened and read.

The Work of the project includes, but is not limited to, new pre-engineered metal building construction for labs and classrooms, associated sitework, new mechanical, electrical, plumbing systems and associated equipment, coordination and supervision of the entire project, and all related work, as indicated in the Bid and Contract Documents.

A cashier's check or bid bond payable to Ingram State Technical College in an amount not less than five (5) percent of the amount of the bid, but in no event more than $10,000, must accompany the bidder's proposal. Performance and statutory Labor and Material Payment Bonds, insurance in compliance with requirements, and verification of E-Verify enrollment (also with Proposals), will be required at the signing of the Contract.

Drawings and Specifications may be examined at the Office of the Architect; and digital Plan Rooms of: Dodge SCAN; Reed Construction Data; AGC Internet Plan Room in Birmingham, Alabama and Alabama Graphics Internet Plan Room in Montgomery, Alabama.

Bid Documents may be obtained from the Architect by digital access/file sharing access for no fee, and/or on CD (PDF format) for a one time deposit of $75.00 (non-refundable; separate check), and/or upon deposit of $200.00 per set (separate check), which will be refunded in full on the first two (2) sets issued to each bidder submitting a bonafide bid, upon return of documents in good and reusable condition within ten (10) days of bid date. Other sets for general contractors, and sets for subs and dealers, may be obtained with the same deposit, which will be refunded as above, less cost of printing, reproduction, handling and distribution, which is estimated to be the same as the deposit amount. *Partial sets will not be available.*

To expedite distribution of bid documents, deposit check(s) should be emailed and then mailed to Goodwyn Mills Cawood, LLC; Attn: Missy Lee; PO Box 242128; Montgomery, AL 36124 (emailed to: missy.lee@gmcnetwork.com).

DRAFT COPY

Bids must be submitted on proposal forms furnished by the Architect or copies thereof. All bidders bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the Provision of Title 34, Chapter 8, Code of Alabama, 1975, as amended, and must show such evidence of license before bidding or bid will not be received or considered by Architect or Owner; The bidder shall show such evidence by clearly displaying their current license number on the outside of the sealed envelope in which the proposal is delivered; Bidder must also include their current license number on the Proposal Form. No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of SIXTY (60) days.

A MANDATORY PRE-BID CONFERENCE will be held at the **Perry County Correctional Center, 4805 Highway 80 East, Uniontown, AL 36786**; at **10:00 AM LOCAL TIME, ON , 2024**, for the purpose of reviewing the project and answering Bidder's questions. **Attendance at the Pre-Bid Conference is MANDATORY for all General Contractor Bidders** intending to submit a Proposal, and is highly recommended for all Subcontractors. Bids from Prequalified General Contractor Bidders who do not attend the Mandatory Pre-Bid Conference will be rejected.

This project is being bid **EXCLUDING TAXES**, and requires the Contractor comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The Contractor and the Owner will be required to apply for Certificates of Exemption with the Alabama Department of Revenue which will handle administration of the Certificates. The Contractor shall account for the tax savings on the Proposal Form.

Additional qualifications and requirements for General Contractor Bidders and separate Subcontractors and Manufacturers are indicated in the Bid and Contract Documents.

The Owner reserves the right to reject any or all proposals and to waive technical errors if, in their judgment, the best interests of the Owner will thereby be promoted.

JF INGRAM STATE TECHNICAL COLLEGE
Deatsville Alabama
Annette Funderburk, President

GOODWYN MILLS CAWOOD, LLC
MEMBERS, AMERICAN INSTITUTE OF ARCHITECTS
2660 Eastchase Lane, Suite 200
Montgomery, Alabama 36117
Phone: (334) 271-3200
Fax: (334) 272-1566

TO ADVERTISE:

3x – Perry County Herald
_____, 2024
_____, 2024

1x – Birmingham News, Montgomery Advertiser, Tuscaloosa News
_____, 2024

NOTE: For projects exceeding $50,000, this notice must be run one time (for municipalities) in a newspaper of general circulation in the county or counties in which the project, or any part of the project, is to be performed. If the project involves an estimated amount exceeding $500,000, this notice must also be run at least once in three newspapers of general circulation throughout the state. Proof of publication is required.

DRAFT COPY

INSTRUCTIONS *to* BIDDERS

CONTENTS

1. Bid Documents
2. General Contractor's State Licensing Requirements
3. Qualifications of Bidders and Prequalification Procedures
4. Preference to Resident Contractors
5. Examination of Bid Documents and the Site of the Work
6. Explanations and Interpretations
7. Substitutions
8. Preparation and Delivery of Bids
9. Withdrawal or Revision of Bids
10. Opening of Bids
11. Incomplete and Irregular Bids
12. Bid Errors
13. Disqualification of Bidders
14. Consideration of Bids
15. Bid Alternates
16. Unit Prices
17. Award of Contract

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, Specific tions 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 qualific tions 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 h w they may obtain copies of the Awarding Authority's published prequalific tion 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, p equalified, o 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 fi e 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 o conditions to be encountered regarding the character, difficulties, quali , 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 specific tions, 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 clarific tion.

(B) Clarific tion 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 specific tions 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 clarific tion of the requirements before submission of a bid.

7 **SUBSTITUTIONS:**

(A) The identific tion 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 bu 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 equirements 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 sou ces, 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 g anted "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 sou ce.

(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 app oved 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 xperience 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 efficie y 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. he form must be completed by typewriter or hand-printed in ink.

(3) Identific tion of Bidder: On the fir t page of the Proposal Form the bidder must be fully identifie 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 figu es. In case of discrepancy between the prices shown in words and in figu es, 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 orporate seal to the Proposal Form.
As used in these Instructions to Bidders, "authorized representative" is defined as a person o 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 o 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 fi e 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 A chitect 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, o 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 fi e alarm contractor and/or fi e sprinkler contractor, Bidders will also submit a copy of the fi e alarm contractor's and/or fi e 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 figu es 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 significan e 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 f om 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 fi ed 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 f om 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 ward 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 BID ALTERNATES:

(A) Bid Alternates: Additive alternate bids are preferred, and may be used in order to obtain prices for the addition of items not included in the base bid. The alternate bids shall be listed in the Proposal Form.

(B) Deductive Bid Alternates: Deductive alternate bids shall only be used with the prior approval of the Chief Facilities Officer.

(C) ACCS reserves the right to select or reject some, any, or all alternates in making the final determination of the lowest responsible and responsive bidder to whom the Construction Contract is awarded.

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 th t 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 o 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 xecution 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.

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

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS
[Revisions and Additions to Standard ACCS Form C5]

1. DOCUMENTS: Drawings and Specifications may be obtained as noted in the Advertisement for Bids.

2. BIDDERS REPRESENTATION: Each Bidder by making their bid represents that they have read and understand the Bid and Contract Documents, and that they have visited the site of the Work, and familiarized themselves with all local conditions affecting the Work.

3. UNIT PRICES: *ATTACHMENT A TO PROPOSAL FORM (No Unit Prices – **Not Required**)*

4. ALLOWANCES: Include in Base Bid. Refer to Section 01020 - "Allowances", and Drawings for descriptions and requirements; **Include in Base Bid**.

5. COMPLETION DATE: All Base Bid and any Alternate Work in the Contract shall commence on the date of the Owner's written "Notice To Proceed", and shall be "Substantially Complete" no later **270** consecutive calendar days thereafter.

   NOTE THAT ALL SUBCONTRACTORS AND SUPPLIERS ARE SUBJECT TO APPROVAL BY THE OWNER.

6. MAJOR SUBCONTRACTOR AND SUPPLIER LISTING: Refer to "Attachment B to Proposal Form" (DUE along with Proposal Form on Bid Date, or at Contractor's option, turned in to the Owner within24-hours after receipt of Bids, with a copy to the Architect).

7. ACCOUNTING OF SALES TAX: Refer to "Attachment C to Proposal Form" (DUE along with Proposal Form on Bid Date).

8. IMMIGRATION STATUS VERIFICATION: Refer to "General Conditions" portion of the Project Manual (DUE along with Proposal Form on Bid Date). Executed E-VERIFY "Memorandum of Understanding"

9. PREPARATION OF BID: Enclose bid and other required Bid Date Submittals in a sealed envelope bearing the name of the work and of the bidder, and the bidder's State License Number for General Contracting. Prepare bid on forms bound in Project Manual or otherwise furnished by the Architect. Only one (1) copy is required.

   After the bid has been sealed, minor adjustments may be made to the Bid over the signature of the person who signed the proposal form, or by their authorized representative, subject to verification. Such corrections shall be made on the face of the sealed envelope, and must not reveal the amount of the original bid.

10. QUESTIONS: Informal questions regarding the work should be directed to Goodwyn, Mills & Cawood, Inc., or their Consultants, and copied to the Architect. Refer to "Project Directory" for names and responsibility of various persons involved, their addresses, telephone & Fax numbers.

11. PROPOSAL GUARANTY: Bid Bond shall be on standard Alabama Building Commission bond form. The bid security shall insure that the Bidder will enter into a contract with the Awarding Authority, and will furnish the specified 100% Performance and Payment Bonds, and General Contractor's insurance certificates with the Contract forms, provided such presentation is made within ninety (90) days of the receipt of the bids, rather than thirty (30) days originally indicated in "Instructions To Bidders".

12. OPENING OF BIDS: Bids will be publicly opened and read aloud at place and time stated in the "Advertisement for Bids". Bids received after that time will not be considered.

13. **A PRE-BID CONFERENCE** will be held at the same location as the bid opening, at 2:00 PM LOCAL TIME ON _____, _____, 2024, for the purpose of reviewing the project, touring the job site, and answering Bidder's questions.

14. MODIFICATION AND WITHDRAWAL: After the bid opening bids may be withdrawn or modified only after the expiration of ninety (90) days, rather than sixty (60) days originally indicated in "Instructions To Bidders".

15. LIST OF SUBCONTRACTORS AND SUPPLIERS: In accordance with regulations of the Alabama Community College System (ACCS), each bid shall have attached a list of major subcontractors and suppliers proposed for the principal parts of the work, which is to be turned in with a copy of the Proposal Form on Bid Date, or at Contractors' option, turned in to the Owner within 24-hours after receipt of Bids, with a copy to the Architect. Bidders failing to submit such list, as indicated, will be considered non-responsive and will be rejected; Bidders failing to submit a complete list may be rejected. Refer to "**Attachment B To Proposal Form**" for required Certification and additional information and requirements.

    ALL SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS (INCLUDING IN PART, THOSE NAMED ON THE 'ATTACHMENT B'), SHALL BE IN COMPLIANCE WITH THE MINIMUM EXPERIENCE REQUIREMENTS OF THE BID AND CONTRACT DOCUMENTS, AND WHERE STATED AS REQUIRED SHALL BE EITHER PREAPPROVED FOR BIDDING BY THEIR BUSINESS NAME OR SHALL HAVE BEEN SUBMITTED AND PREAPPROVED FOR BIDDING IN WRITING OR BY ADDENDUM BY THE ARCHITECT; ALL STILL SUBJECT TO COMPLIANCE WITH REQUIREMENTS; THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL COST FOR COMPLIANCE.

    Subcontractors listed and thereafter approved may not be changed without approval of the Owner and/or Director. The list of subcontractors will not constitute a qualification of the bid, and acceptance of a bid with such list will not constitute a waiver of any pre-approval requirement or other requirement of qualification or experience as applies to subcontractors.

    Bidders should base their lists on the assumption that all Alternates will be accepted. As soon as possible after the bid opening, bidders will be advised which alternates, if any, should be considered in completion of the list. If the actual accepted alternates change, the successful bidder will be given an opportunity to justify modification or modify their list.

16. Pursuant to Act 2013-205, Section 1(g), the Contractor shall in part, account for the sales and use tax NOT included in the bid Proposal Form as indicated in **"Attachment C To Proposal Form-Accounting of Sales Tax", ACCS Form 5-H**, which is to be turned in with the Proposal Form on Bid Date; and also to Section 01061 - "Regulatory Requirements & Tax Exemptions" for additional information and requirements.
    Failure to provide this accounting of sales tax shall render the bid non-responsive and it will be rejected. 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.

17. SUBSTITUTIONS, PRE-BID QUALIFICATIONS, AND PRE-QUALIFIED SUBCONTRACTORS AND SUPPLIERS: Refer to Section 01015 - "Special Conditions", and individual specification sections.

18. BIDDER QUALIFICATION: Release of bidding documents by the Architect to a prospective Bidder, Subcontractor, or Supplier will not constitute any determination by the Owner or Architect that said bidder has been found to be "qualified", or "responsible", or properly licensed, or insurable, or bondable, under applicable state law or under the requirements of these Bid and Contract Documents.

    Qualifications and minimum experience requirements for Subcontractors and Suppliers are stated at various locations throughout the Project Manual and Bid Documents. In the event a General Contractor desires to perform "qualified" Subcontractor work with their own forces, they shall be required to provide documentation and comply with all of the same criteria and qualifications as the comparable Subcontractor(s).

    Compliance with the Alabama Immigration Law is also required and Contractor's verification of E-Verify enrollment shall be included with any proposal. Refer to "Immigration Status Verification" in "General Conditions" portion of the Project Manual for additional information and requirements.

19. PERMIT FEE – **TO BE PAID BY CONTRACTOR**: The Contractor shall pay the Construction Permit Fee required by the City of Alexander City.

    The "Plan Review Fee" will be paid by the Owner.

20. INSPECTIONS:

    A. Refer to The City of Uniontown for all required inspections.

21. SCHEDULING OF INSPECTIONS: The contractor will notify the City of Uniontown of the date the project will be ready for an inspection.

22. MINIMUM REQUIREMENTS FOR REQUIRED INSPECTIONS: The Contractor will contact the City of Uniontown for minimum requirements.

23. PRE-CONSTRUCTION CONFERENCE

    A. Required Attendees: Contractor, Owner, Architect, Major Subcontractors Inspection Requirements:

    - Signed construction contract.
    - Verification of payment of permit fee.
    - Contractor's Statement of Responsibility and Quality Assurance Plan (for storm shelter).
    - Fire Alarm Contractor's Certification (from State Fire Marshal).
    - ADEM permit, if more than 1 acre of land is disturbed.

24. PRE-ROOFING CONFERENCE (NOT REQUIRED)

25. ABOVE-CEILING INSPECTIONS

    A. Required Attendees: Contractor, Owner, Architect, MEP Engineers, and Major Subcontractors.

    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 BC Inspector.

26. LIFE SAFETY INSPECTIONS AND FINAL INSPECTIONS

A. Required Attendees: Contractor, Owner, Architect, Engineers, Major Subcontractors, and Local Fire Marshal.

Inspection Requirements:

- Fire alarm certification.
- Above ground and below ground sprinkler certifications.
- Emergency and exit lighting tests.
- Fire alarm must be monitored.
- Flush test for underground sprinkler lines (witnessed by local fire marshal, fire chief).
- 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.

27. YEAR-END INSPECTIONS

A. Required Attendees: Contractor, Owner, Architect, and Engineers; and/or Major subcontractors may also be required to attend.

Inspection Requirements:

Owner's list of documented warranty items.

28. DAVIS-BACON ACT

A. The Contractor is responsible for adhering to all requirements set forth in the Davis-Bacon Act and adhering to the current prevailing wages for the locality in which the project resides. Additional information and current prevailing wage rates are available at www.sam.gov.

END OF SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

PROPOSAL FORM

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

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:
NEW ISTC BUILDING AT PERRY COUNTY CORRECTIONAL FACILITY FOR J.F. INGRAM STATE TECHNICAL COLLEGE, UNIONTOWN, ALABAMA

in accordance with Drawings and Specifications, dated 09/27/2024 , prepared by:

GOODWYN MILLS CAWOOD, LLC GMC PROJECT NO. AMGM240006 , Architect/Engineer

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

having its principal offices in the City of: _____,

is: ◯ a Corporation ◯ a Partnership ◯ an Individual ◯ Other: _____

LISTING OF PARTNERS OR OFFICERS:

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

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

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

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

_____ Dollars ($)

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

For Alternate No. 1 (<Keyword for Amount>) ◯ add ◯ deduct $

For Alternate No. 2 (<Keyword for Amount>) ◯ add ◯ deduct $

For Alternate No. 3 (<Keyword for Amount>) ◯ add ◯ deduct $

For Alternate No. 4 (<Keyword for Amount>) ◯ add ◯ deduct $

For Alternate No. 5 (<Keyword for Amount>) ◯ add ◯ deduct $

For Alternate No. 6 (<Keyword for Amount>) ◯ add ◯ deduct $

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

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

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

- ☐ Bid Bond, executed by _____ as Surety,
- ☐ A cashier's check on the _____ Bank: _____,
  for the sum of: _____
  Dollars ($_____) made payable to the Awarding Authority.

BIDDER'S ALABAMA LICENSE:

State License for General Contracting: _____ / _____ / _____

License Number **Bid Limit** **Type(s) of Work**

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

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

Legal Name of Bidder: _____

Mailing Address: _____

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

*Name & Title (Print):

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.

ATTACHMENT A

TO PROPOSAL FORM

1.1 UNIT PRICES:

A. The undersigned proposes the following Unit Prices for additions to or deductions from the Work wherein Unit Prices are applicable as determined by the Architect and Owner. These Unit Prices include all charges for labor and materials, fee, layout, supervision (field and home office), general expenses, taxes, insurance, overhead and profit, for Unit Item of Work installed in place. The Contract sum shall be increased or decreased based upon quantity difference multiplied by the applicable Unit Price, in accordance with the General Conditions.

B. Refer to Section 01026 - "Unit Prices", and to the respective sections of the Specifications for the complete Unit Price Item description.

C. Submit the following Unit Prices with the Proposal Form on Bid Date.

	ITEM DESCRIPTION:	UNIT:*	UNIT PRICE:
1.	Mass Earth Excavation	CY	$ _____
2.	Trench Earth Excavation	CY	$ _____
3.	Hand Earth Excavation	CY	$ _____
4.	Additional Soil:		
	a. Topsoil	CY	$ _____
	b. General or Open Site Areas	CY	$ _____
	c. Trench Backfill	CY	$ _____
	d. Select Fill - On-Site Source	CY	$ _____
	e. Select Fill - Off-Site Source	CY	$ _____
5.	Rock, Masonry, or Concrete Excavation in Trenches and Pits, below elevations indicated, and which is not part of required Base Bid and Alternate Work:	CY	$ _____
6.	Rock, Masonry, or Concrete Excavation in Open Excavation, below Base Bid and Alternate elevations indicated, and which is not part of required Base Bid and Alternate Work:	CY	$ _____
7.	Geotextile stabilization fabric	SY	$ _____
8.	Crushed stone	TON	$ _____

9.	6" PVC or HDPE underdrain	LF	$ _____
10.	Erosion control fabric for slope stabilization	SY	$ _____
11.	Sod	SY	$ _____
12.	Concrete Mud Footings	CY	$ _____
13.	Construction Fencing	LF	$ _____
14.	Silt Fencing	LF	$ _____

END OF ATTACHMENT A TO PROPOSAL FORM

(*) Legend to "Unit" quantity abbreviations:
CY = Per "Cubic Yard"
LF = Per "Linear Foot"
SY = Per "Square Yard"
TON = Per "Ton"

ATTACHMENT B

TO PROPOSAL FORM

CERTIFICATION: I HEREBY CERTIFY THAT ALL SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS (INCLUDING IN PART, THOSE NAMED BELOW), ARE IN COMPLIANCE WITH THE MINIMUM EXPERIENCE REQUIREMENTS OF THE BID AND CONTRACT DOCUMENTS, AND WHERE STATED AS REQUIRED ARE EITHER PREAPPROVED FOR BIDDING BY THEIR BUSINESS NAME OR HAVE BEEN SUBMITTED AND PREAPPROVED FOR BIDDING IN WRITING OR BY ADDENDUM BY THE ARCHITECT; ALL STILL SUBJECT TO COMPLIANCE WITH REQUIREMENTS; THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL COST FOR COMPLIANCE.
SUBMITTED BY - GENERAL CONTRACTOR'S FIRM NAME:

_____ **DATE:** _____

1.1 PRINCIPAL SUBCONTRACTORS AND SUPPLIERS LISTING:

A. Submit the following Principal Subcontractors and Suppliers information with the Proposal Form on Bid Date, **OR at Contractor's option, turned in to the Owner within 24-hours after receipt of Bids, with a copy to the Architect:**

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
1		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
2		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
3		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
4		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
5		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)

NO.:	SPECIFICATION SECTION:	PRINCIPAL SUBCONTRACTOR OR SUPPLIER - NAME and LOCATION:
6		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
7		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
8		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
9		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
10		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
11		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)
12		_____; (FIRM NAME) _____. (LOCATION - CITY and STATE)

END OF ATTACHMENT B TO PROPOSAL FORM

FACILITIES DIVISION

ACCS FORM 5-H

(Must be submitted with ACCS Form 5-E)

ACCOUNTING OF SALES TAX
ATTACHMENT TO ACCS FROM 5-E: PROPOSAL FORM

TO:	ALABAMA COMMUNITY COLLEGE SYSTEM	**DATE:**	
NAME OF PROJECT:	NEW ISTC BUILDING AT PERRY COUNTY CORRECTIONAL FACILITY, UNIONTOWN, ALBAMA		

SALES TAX ACCOUNTING

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

			ESTIMATED SALES TAX AMOUNT
BASE BID:			Dollars $
For Alternate No. 1 (	<Keyword for Amount>)	○ add	○ deduct $
For Alternate No. 2 (	<Keyword for Amount>)	○ add	○ deduct $
For Alternate No. 3 (	<Keyword for Amount>)	○ add	○ deduct $
For Alternate No. 4 (	<Keyword for Amount>)	○ add	○ deduct $
For Alternate No. 5 (	<Keyword for Amount>)	○ add	○ deduct $
For Alternate No. 6 (	<Keyword for Amount>)	○ 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 (Print):

*Title (Print):

*Telephone Number:

Email Address:

(SEAL)

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

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

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

THIS PAGE INTENTIONALLY LEFT BLANK

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:**

Review/Initial of Regional Facilities Director _____

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

ATTACHMENTS:

- ☐ Proposal Form **(ACCS Form 5-E)**
- ☐ List of all proposed major subcontractors and suppliers
- ☐ Accounting of Sales Tax **(ACCS Form 5-H)**
- ☐ Bid Tabulation
- ☐ Certificate of Liability Insurance
- ☐ **Performance Bond (ACCS Form 2-C)**
- ☐ **Payment Bond (ACCS Form 2-D)**
- ☐ State of Alabama Disclosure Statement
- ☐ E-Verify Memorandum of Understanding
- ☐ **W-9** (Request for Taxpayer Identification Number and Certificate)

Review/Initial of Regional Facilities Director _____

FACILITIES DIVISION

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 DIVISION

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:**

_____
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.

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

ACCS FORM 2-B

GENERAL CONDITIONS *of the* CONTRACT

CONTENTS

1. Definitions
2. Intent and Interpretation of the Contract Documents
3. Contractor's Representation
4. Documents Furnished to Contractor
5. Ownership of Drawings
6. Supervision, Superintendent, & Employees
7. Review of Contract Documents and Field Conditions by Contractor
8. Surveys by Contractor
9. Submittals
10. Documents and Samples at the Site
11. "As-built" Documents
12. Progress Schedule
13. Materials, Equipment & Substitutions
14. Safety & Protection of Persons & Property
15. Hazardous Materials
16. Inspection of the Work
17. Correction of Work
18. Deductions for Uncorrected Work
19. Changes in the Work
20. Claims for Extra Cost or Extra Work
21. Differing Site Conditions
22. Claims for Damages
23. Delays
24. Resolution of Claims and Disputes
25. Owner's Right to Correct Work
26. Owner's Right to Stop or Suspend the Work
27. Owner's Right to Terminate Contract
28. Contractor's Right to Suspend or Terminate
29. Progress Payments
30. Certification & Approvals for Payments
31. Payments Withheld
32. Substantial Completion
33. Occupancy or Use Prior to Completion
34. Final Payment
35. Contractor's Warranty
36. Indemnification Agreement
37. Insurance
38. Performance and Payment Bonds
39. Assignment
40. Construction by Owner or Separate Contracts
41. Subcontracts
42. Architect's Status
43. Cash Allowances
44. Permits, Laws and Regulations
45. Royalties, Patents and Copyrights
46. Use of the Site
47. Cutting and Patching
48. In-progress and Final Cleanup
49. Liquidated Damages
50. Use of Foreign Material
51. Sign

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

A INTENT
It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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

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

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

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

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

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

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

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

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

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

F **SEVERABILITY**

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

Article 3
CONTRACTOR'S 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.

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

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

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

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

C Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.

D The Contractor shall not be entitled to any adjustment of the Contract Sum for damage due to delays claimed pursuant to this Article unless the delay was caused by the Owner or Architect and was either:

(1) the result of bad faith or active interference or

(2) beyond the contemplation of the parties and not remedied within a reasonable time after notification by the Contractor of its presence.

Article 24
RESOLUTION *of* CLAIMS *and* DISPUTES

A **APPLICABILITY *of* ARTICLE**

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

(2) "Resolution" addressed in this Article applies only to Claims and Disputes arising between the Contractor (or its Surety) and Owner and asserted after execution of the Construction Contract and prior to the date upon which final payment is made. Upon making application for final payment the Contractor may reserve the right to subsequent Resolution of existing Claims by including a list of all Claims, in stated amounts, which

remain to be resolved and specifically excluding them from any release of claims executed by the Contractor, and in that event Resolution may occur after final payment is made.

B **CONTINUANCE *of* PERFORMANCE**

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

C **GOOD FAITH EFFORT *to* SETTLE**

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

D **FINAL RESOLUTION for STATE-FUNDED CONTRACTS**

(1) If the Contract is funded in whole or in part with state funds, the final Resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner shall be by the 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 $100,000):

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

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

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

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

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

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

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

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

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

(3) Procedure for Bonded Construction Contracts (Generally, contracts over $100,,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 for ACCS Projects shall be governed by Title 39 of the Alabama Code.

(2) "Retainage" is defined as that money belonging to the contractor which has been retained by ACCS conditioned on final completion and acceptance of all work in connection with a project or projects by the contractor. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work.

(3) In making progress payments the Owner shall retain five percent of the estimated amount of work done and the value of materials stored on the site or suitably stored and insured off-site, and after 50 percent completion has been accomplished, no further retainage shall be withheld. The retainage as set out above shall be held until final completion and acceptance of all work covered by the contract.

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.

F The Contractor shall complete or correct all items of any remaining Work ("punch list" items) , ready for re-inspection for Final Acceptance, within 30 days after the Date of Substantial Completion unless another date is specified in the Certificate of Substantial Completion. 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. Failure to complete or correct any items of remaining Work ("punch list" items) within 60 days will result in all warranties commencing on the Date of Final Acceptance.

G Nothing herein, including paragraph E above, shall limit or waive the Owner's rights under Article 27, including but not limited to issuance of Notices to Cure or Notice of Termination issued to Contractors and Sureties, to obtain completion, correction, or repair of any remaining unfinished Work ("punch list" items).

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 $100,000 or less, there is no requirement for Advertisement for Completion.

(2) If the Contract Sum is more than $100,000: 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.

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.

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.

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 $100,000, unless bonds are required for this Contract in the Supplemental General Conditions.

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

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

FACILITIES DIVISION

ACCS FORM 6-L

GENERAL CONTRACTOR'S ROOFING GUARANTEE

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

ACCS PROJECT#:			
PROJECT NAME:			
Address:			
PROJECT OWNER:			
Address:			
CONTRACTOR COMPANY:			
Address:		Phone:	
		Email:	

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

BY: _____
SIGNEE'S PRINTED NAME

TITLE: _____
SIGNEE'S TITLE

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

ACCS FORM 6-D

APPLICATION AND CERTIFICATE FOR PAYMENT

Attach Schedule of Values. Attach Current Progress Schedule.

ACCS PROJECT#:		**APPLICATION#:**		**DATE:**	
PROJECT:					
TO OWNER:					
Address:		Phone:			
		Email:			
FROM CONTRACTOR:					
Address:		Phone:			
		Email:			
ARCHITECT/ENGINEER:					
Address:		Phone:			
		Email:			

TOTAL ORIGINAL CONTRACT:	$ 0.00
FULLY EXECUTED CHANGE ORDER(S) NUMBERS 0 **THROUGH**	$ 0.00
TOTAL CONTRACT TO DATE:	$ 0.00
Work Completed to Date per attached Schedule of Values:	$ 0.00
Stored Materials:	$ 0.00
Total Completed Work and Stored Materials: (0.00 % of Contract To Date)	$ 0.00
5% of Total Completed Work and Stored Materials (TCWSM) is retained when TCWSM is less than or equal to 50% of Total Contract to Date. 0% retained when TCWSM is more than 50% of Total Contract to Date. 0 is retained on final pay app.	☐ **Final Payment Application**
Less Retainage: $ 0.00 **Total Due:**	$ 0.00
Less Total Previous Payments:	$ 0.00
Balance Due This Estimate:	$ 0.00

1 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)

_____
NOTARY PUBLIC'S SIGNATURE

2 ARCHITECT'S/ENGINEER'S CERTIFICATION

In accordance with the Contract Documents, the Architect/Engineer certifies to the Owner and College that to the best of the Architect's/Engineer's knowledge and belief:

1. the work has progressed to the point indicated herein **and according to the updated attached progress schedule,**
2. the quality of the Work is in accordance with the Contract documents, and
3. the Contractor is entitled to payment of the amount approved.

By: _____ **Date:** _____
ARCHITECT'S/ENGINEER'S SIGNATURE

Name: _____

Title: _____

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

3 COLLEGE APPROVAL (non-final progress schedule attached)

By: _____
COLLEGE

Name: _____

Title: _____

Date: _____

IF APPLICABLE: ANY PAY APPLICATION THAT REDUCES RETAINAGE REQUIRES ACCS APPROVAL PRIOR TO PROCESSING FOR PAYMENT

_____ **Name:** _____ **Date:** _____
ACCS FACILITIES REPRESENTATIVE

VER: 10012024

THIS PAGE INTENTIONALLY LEFT BLANK

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:	$ -	$ -	$ -	$ -	$ -		$ -	$ -

THIS PAGE INTENTIONALLY LEFT BLANK

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.

THIS PAGE INTENTIONALLY LEFT BLANK

ACCS FORM 6-H

SAMPLE PROGRESS SCHEDULE & REPORT

ACCS Project No.:

PROJECT:

CONTRACTOR (Contractor may use own form):

ARCHITECT/ENGINEER:

DATE OF REPORT:

PROCEED DATE:

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.

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

ACCS FORM 2-G

***NOTE: Any Change Order without documented ACCS Facilities Division approval is the expense of the Architect and/or the Contractor.**

CHANGE ORDER JUSTIFICATION

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

CHANGE ORDER #		ACCS PROJECT #		DATE:	

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 **THE CHANGE ORDER IS:**

- ◯ Owner directed changes in the Work
- ◯ Differing (hidden) site conditions
- ◯ Other (please explain in Section D)

JUSTIFICATION FOR NEED OF CHANGE(S):

Attach documented written approval from ACCS to proceed with change order.

E **JUSTIFICATION OF CHANGE ORDER** vs. **COMPETITIVE BID:**

F **ARCHITECT/ENGINEER'S EVALUATION OF PROPOSED COST:**

Review/Initial of Regional Facilities Director _____

ACCS FORM 2-G

G CHANGER ORDER RECOMMENDED	CHANGE ORDER JUSTIFIED AND APPROVED
_____ ARCHITECTURAL/ENGINEERING FIRM NAME BY: _____ ARCHITECT/ENGINEER'S SIGNATURE BY: _____ OWNER'S DESIGNATED REPRESENTATIVE SIGNATURE	BY: _____ ACCS CHIEF FACILITIES OFFICER BY: _____ OWNER'S LEGAL COUNSEL'S SIGNATURE (FOR CHANGE ORDERS 10% OR GREATER)

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. Select the type of Change Order. Attach documented written approval.

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.

Review/Initial of Regional Facilities Director _____

FACILITIES DIVISION

ACCS FORM 2-F

***NOTE: Any Change Orders without documented ACCS Facilities Division approval will be at the expense of the Architect and/or the Contractor.**

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.)

Review/Initial of Regional Facilities Director _____

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

BY: _____

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)

Review/Initial of Regional Facilities Director _____

FACILITIES DIVISION

ACCS FORM 6-K

CERTIFICATE OF SUBSTANTIAL COMPLETION

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

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

	ACCS PROJECT#:	
OWNER ENTITY NAME AND ADDRESS: Email to receive executed copy:	**ARCHITECTURAL/ENGINEERING FIRM NAME & 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. Failure to complete or correct any items of remaining Work ("punch list" items) within 60 days will result in all warranties commencing on the Date of Final Acceptance.

Nothing herein shall limit or waive the Owner's rights under Article 27 of the General Conditions (ACCS Form 2-B), including but not limited to issuance of Notices to Cure or Notice of Termination issued to Contractors and Sureties, to obtain completion, correction, or repair of any remaining unfinished Work ("punch list" items).

Only one (1) originally executed substantial completion form shall be routed for signature. ACCS Facilities Division office will mail the fully-executed original to the Owner and email copies to all parties.

RECOMMENDED BY:	
ARCHITECT/ENGINEER	DATE

APPROVALS:	
AHJ INSPECTOR (IF APPLICABLE)	DATE
***A/E PEER REVIEWER**(IF APPLICABLE)	DATE
OWNER'S DESIGNATED REPRESENTATIVE	DATE
ACCS REGIONAL FACILITIES DIRECTOR	DATE

CONTRACTING PARTIES:	
CONTRACTOR	DATE
ACCS CHIEF FACILITIES OFFICER	DATE

*ACCS Colleges are required to provide an A/E Peer Reviewer to review the A/E of Record's project design and to perform construction inspections when AHJ is not present in city/town where project's work is taking place.

Required Certification: The Certification of Structural Observations (ACCS Form 6-J) shall be prepared by the Structural Engineer of Record for all projects containing classrooms or dorm rooms on the grounds of public institutions of higher education as required by ACT#2012-554. Where applicable to the project, the certification must be attached to the Certificate of Substantial Completion.

FACILITIES DIVISION

ACCS FORM 6-M

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:

at:

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)

BUSINESS ADDRESS:

_____

(Contractor)

NOTE: This notice must be run once a week for three successive weeks for projects exceeding $100,000. For projects of $100,000 or less, there is no requirement for Advertisement for Completion. 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.

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

ACCS FORM 6-N

CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

ACCS PROJECT#:	
DATE OF THE CONSTRUCTION CONTRACT:	
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

NAME :

ADDRESS :

_____

SIGNATURE OF AUTHORIZED REPRESENTATIVE

BY: _____

SIGNEE'S PRINTED NAME

TITLE: _____

SIGNEE'S TITLE

Sworn to and subscribed before me this

_____ day of _____ ,

_____ .

_____

NOTARY PUBLIC'S SIGNATURE

My commission expires: _____

SEAL

VER: 03282024

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

ACCS FORM 6-P

CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS

ACCS PROJECT#:	
DATE OF THE CONSTRUCTION CONTRACT:	
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. 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

NAME :

ADDRESS :

_____

SIGNATURE OF AUTHORIZED REPRESENTATIVE

BY: _____

SIGNEE'S PRINTED NAME

TITLE: _____

SIGNEE'S TITLE

Sworn to and subscribed before me this

_____ day of _____ ,

_____ .

_____

NOTARY PUBLIC'S SIGNATURE

My commission expires: _____

SEAL

VER: 03282024

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES MANAGEMENT

ACCS FORM 6-Q

CONSENT OF SURETY TO FINAL PAYMENT

ACCS PROJECT#:	
DATE OF THE CONSTRUCTION CONTRACT:	
SURETY'S BOND NUMBER:	

TO: OWNER (THE 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:

on bond 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 AUTRHORIZED REPRESENTATIVE

_____

PRINTED NAME AND TITLE

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

THIS PAGE INTENTIONALLY LEFT BLANK

FACILITIES DIVISION

ACCS FORM 6-J

CERTIFICATION OF STRUCTURAL OBSERVATIONS

ACCS PROJECT#:	
PROJECT NAME:	
OWNER:	
CONTRACTING COMPANY:	

I _____, do hereby verify that I have personally conducted the visual Design Professional observations of the construction of the structural system for conformance to the approved construction documents for the referenced project. The visual observations of the structural systems were personally conducted by me at all significant construction stages and at the completion of the construction of the structural system. To the best of my knowledge, all structural deficiencies have been resolved except as noted below:

Signed on this date, _____ **Design Professional's Seal**

_____

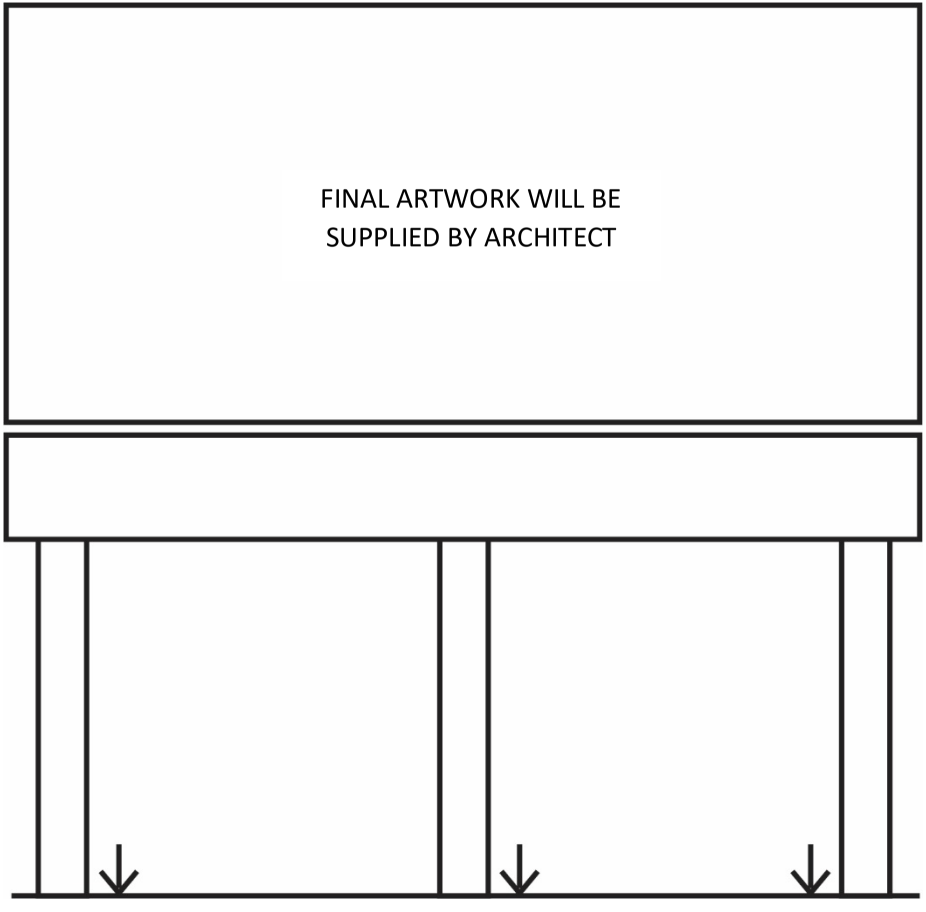
ARCHITECTURAL / ENGINEERING FIRM

_____

SIGNATURE OF ARCHITECT OR
STRUCTURAL ENGINEER OF RECORD

PRINTED NAME: _____

THIS PAGE INTENTIONALLY LEFT BLANK



SIGN: 8’ X 4’ SIGN WITH 8’ X 1’ADDITION PRINTED ON ½” THICK COROPLAST OR CORRUGATED ALUMINUM, PRINTED ON FLAT-BED ARIZONA PRINTER OR EQUIVALENT WITH UV INKS IN FULL COLOR. CONTACT ARCHITECT FOR FINAL ARTWORK.

OPTION: PRINT ON EXTERIOR GRADE VINYL WITH UV INKS IN FULL COLOR APPLIED TO 8’ X 4’ X ½” THICK COROPLAST OR CORRUGATED ALUMINUM. CONTACT ARCHITECT FOR FINAL ARTWORK.

WOOD POSTS: P.T. 4 X 4 X FULL HEIGHT OF SIGN, WITH 45˚ TO 60˚ SLOPED P.T. 4 X 4 WOOD BACK BRACES FROM TOP OF SIGN, BRACE BETWEEN POSTS AT TOP & BOTTOM W/FLAT P.T. 2 X 6 OR 4 X 4. SET POSTS 3’- O” MINIMUM INTO GROUND, IN 12” DIAMETER X 3’ - 6” DEEP CONCRETE FOOTINGS.

TOP OF SIGN: 7 FT. TO 8 FT. ABOVE FINISHED GRADE.

THIS PAGE INTENTIONALLY LEFT BLANK

IMMIGRATION STATUS VERIFICATION

1.1 GENERAL:

A. Bidders are hereby reminded that they are required to comply with requirements of Alabama Immigration Law, Act 2011-535 (also referred to as the "Beason-Hammon Alabama Taxpayer and Citizen Protection Act", or H.B. 658), as amended by Act No. 2012-491, including in part and effective January 1, 2012, **enrollment in the E-Verify Program of the United States Department of Homeland Security**:

1. Contractor's signed "E-Verify Memorandum of Understanding" will be required to be attached to any Contract awarded.
2. General Contractors and Subcontractors shall be enrolled in, participate in and maintain compliance for the duration of this contract, and as otherwise required by statute.

B. The following statement shall and will be included in the Contract for Construction:

"By signing this contract, 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."

C. Additional information and Guidance is available at the following websites:

1. E-Verify portal maintained by State of Alabama: http://immigration.alabama.gov

2. Alabama Office of the Attorney General Website: http://www.ago.alabama.gov/Page-Immigration

3. Alabama Division of Construction Management: http://www.bc.state.al.us/PDFs/Bulletins/GuidanceonAct2012-491-DatedMay-29-2012.pdf

4. US Department of Homeland Security, E-Verify: www.dhs.gov/E-Verify

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

State of Alabama

Disclosure Statement

Required by Article 3B of Title 41, Code of Alabama 1975

ENTITY COMPLETING FORM

ADDRESS

CITY, STATE, ZIP TELEPHONE NUMBER

STATE AGENCY/DEPARTMENT THAT WILL RECEIVE GOODS, SERVICES, OR IS RESPONSIBLE FOR GRANT AWARD

ADDRESS

CITY, STATE, ZIP TELEPHONE NUMBER

This form is provided with:

☐ Contract ☐ Proposal ☐ Request for Proposal ☐ Invitation to Bid ☐ Grant Proposal

Have you or any of your partners, divisions, or any related business units previously performed work or provided goods to any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify below the State Agency/Department that received the goods or services, the type(s) of goods or services previously provided, and the amount received for the provision of such goods or services.

STATE AGENCY/DEPARTMENT	TYPE OF GOODS/SERVICES	AMOUNT RECEIVED

Have you or any of your partners, divisions, or any related business units previously applied and received any grants from any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify the State Agency/Department that awarded the grant, the date such grant was awarded, and the amount of the grant.

STATE AGENCY/DEPARTMENT	DATE GRANT AWARDED	AMOUNT OF GRANT

1. List below the name(s) and address(es) of all public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF PUBLIC OFFICIAL/EMPLOYEE	ADDRESS	STATE DEPARTMENT/AGENCY

2. List below the name(s) and address(es) of all family members of public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the public officials/public employees and State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF FAMILY MEMBER	ADDRESS	NAME OF PUBLIC OFFICIAL/ PUBLIC EMPLOYEE	STATE DEPARTMENT/ AGENCY WHERE EMPLOYED

If you identified individuals in items one and/or two above, describe in detail below the direct financial benefit to be gained by the public officials, public employees, and/or their family members as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

Describe in detail below any indirect financial benefits to be gained by any public official, public employee, and/or family members of the public official or public employee as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

List below the name(s) and address(es) of all paid consultants and/or lobbyists utilized to obtain the contract, proposal, request for proposal, invitation to bid, or grant proposal:

NAME OF PAID CONSULTANT/LOBBYIST	ADDRESS

By signing below, I certify under oath and penalty of perjury that all statements on or attached to this form are true and correct to the best of my knowledge. I further understand that a civil penalty of ten percent (10%) of the amount of the transaction, not to exceed $10,000.00, is applied for knowingly providing incorrect or misleading information.

Signature Date

Notary's Signature Date Date Notary Expires

Article 3B of Title 41, Code of Alabama 1975 requires the disclosure statement to be completed and filed with all proposals, bids, contracts, or grant proposals to the State of Alabama in excess of $5,000.

Revised: 09/2013

Goodwyn Mills Cawood

PO Box 242128
Montgomery, AL 36124

T (334) 271-3200
F (334) 272-1566

www.gmcnetwork.com

Electronic File Conversion and Transfer Agreement

Goodwyn Mills Cawood, LLC (GMC) in cooperation with its Consultants may, at its sole discretion, provide electronic document and file conversion services to the prime entity holding, or intending to enter into, an Agreement with an Owner for construction of a Project. GMC will typically accept only one request per project from one entity, typically the General Contractor.

Consultants referred to herein are all consultants to GMC for or in connection with the Project, including but not limited to those listed below.

It is acknowledged that neither GMC nor its Consultants are under any obligation to furnish electronic files to any party. The General Contractor and/or Sub-contractors should not, under any circumstances, assume they will receive any or all requested electronic files. Whether files are provided or not, the General Contractor remains completely responsible for performing all work required of the Contract Documents in full, including the preparation of accurate and detailed required shop-drawings.

When furnished, files will be transmitted electronically via FTP Site, or similar file transfer mechanism. It is the intent of GMC to furnish files in a timely manner, typically within two (2) weeks of receipt of payment of fees. However, the complexity and scale of the conversion is directly related to the requested file format and quantity of files requested. Where GMC believes a request will require additional time, we will notify the User and make reasonable effort to deliver files in phases if beneficial.

Please contact Carrie Day at (334) 271-3200 with any questions.

GOODWYN MILLS CAWOOD, LLC

PROJECT

Project Name:	NEW ISTC BUILDING AT PERRY COUNTY CORRECTIONAL FACILITY for INGRAM STATE TECHNICAL COLLEGE and for the ALABAMA COMMUNITY COLLEGE SYSTEM
Project No.:	AMGM240006
Document Issue Date:	September 27, 2024
Prime Architect/ Engineer:	GMC/Hillary Morgan

Goodwyn Mills Cawood, LLC (hereafter “GMC”), for itself and its identified Consultants, hereby grants non-exclusive use of the requested electronic files to the party (User) listed below. User accepts that GMC and its Consultants reserve the right to convey or not convey electronic files at their sole discretion. User further agrees, as a precedent to transmittal of digital files to any other party, to require written agreement of equivalent confidentiality and indemnification provisions from any party that receives the digital files. The digital information furnished under this agreement is proprietary, is the property of GMC and/or its Consultants, and is protected by applicable copyright laws.

The information provided by GMC and/or its Consultants is solely for the convenience of the recipient. Neither GMC nor its Consultants make any warranty or guarantee, express or implied, as to the suitability of the files for any specific purpose. It is understood the files are (1) digital, (2) typically have been converted electronically into a format suitable to the User, (3) are inherently capable of being

manipulated and altered through intentional and unintentional means, (4) are partial and therefore inherently incomplete representations of the Contract Documents, and (5) may include inaccuracies clarified elsewhere in the Contract documents. Consequently, ONLY the COMPLETE Printed Contract Documents, as amended, shall serve as the basis for the scope, quantity, and quality of the work required for the Project. Under no circumstances whatsoever shall GMC and/or its Consultants be or become liable to anyone for the accuracy or completeness of information included in requested electronic files. The burden of, and responsibility for, determining the fitness of data included in electronic files falls solely and completely on the User.

LIMITED USE: The use of any digital file(s) is solely limited to the listed Project below. In no event shall files be utilized for any other Project, or any use beyond the use specifically listed herein. Further, under no circumstances may the General Contractor or and Sub-Contractor submit files furnished under this Agreement as required shop drawing submittals. By execution of this Agreement, the User acknowledges these limitations, and shall comply fully therewith.

CONFIDENTIALITY: User agrees to hold Project information strictly confidential, and User agrees it shall limit the use of transmitted electronic files solely to those applications necessary to perform work required for the Project.

INDEMNIFICATION: User hereby agrees to indemnify, defend, and hold harmless GMC, its directors, officers, and employees, and its Consultants, Consultant's directors, Consultants officers and employees, and the insurers, agents, and affiliates of both GMC and its Consultants, from any and all liability including claims for consequential damages or attorney's fees that may arise out of or relate in any matter to the authorized or unauthorized use, reuse, or alteration of this information by User, its employees or agents, vendors, contractors, sub-contractors, or any other party.

REVISIONS: The Contract Documents are subject to change, and revisions are not always incorporated throughout the documents. It is the User's sole responsibility to review the complete current Contract Documents, and identify inconsistencies between the electronic files and the current Contract Documents.

DIGITAL PROTOCOL: The USER is solely responsible for examination of digital files for virus contamination. Neither GMC nor its Consultants, or the directors, officers, employees, insurers, agents, or affiliates of either are responsible for damages incurred due to virus contamination, or for software version and/or file compatibility, or any similar hardware or software compliance issues.

FEE STRUCTURE: Prior to conversion of files, GMC must receive this complete Electronic File Conversion and Transfer Agreement, completed in full, and executed by a representative of the User with authorization to enter into contracts on behalf of the User.

			PER SHEET FEE
Civil	C		$125
Architecture	A		$150
Structural	S		$125
Mechanical	M, P, FP		$125
Electrical	E		$125
Other	G, etc.		$100

USER ACCEPTANCE OF AGREEMENT

Company Name:

By: _____

Its: _____

Date: _____

REQUESTED FILE FORMAT

User (Select ONE)	File Format
	Bound Auto CAD Release 2015
	Bound Auto CAD Release 2013
	Bound Auto CAD (*Please indicate earlier version, if required -* _____*)*

SCHEDULE OF REQUESTED FILES (To be filled by User)

SHEET		INTENDED USE
No.	Name.	

(PRINT ADDITIONAL FORMS AS REQUIRED)

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01010

SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND GENERAL INFORMATION:

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

1.2 PROJECT/WORK IDENTIFICATION:

A. General: Project name is **"NEW ISTC BUILDING AT PERRY COUNTY CORRECTIONAL FACILITY FOR INGRAM STATE TECHNICAL COLLEGE; Uniontown, Alabama, for the Alabama Community College System,** as shown on the Contract Documents prepared by Goodwyn Mills Cawood, LLC, dated **September 27, 2024.**

B. Contract Documents: Indicate the work of the Contract and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated in the Contract Documents, in Base Bid and various Alternates, include but are not necessarily limited to the following:

1. Existing site conditions and restrictions on use of the site.
2. Demolition of existing improvements, where indicated and as otherwise required to accommodate the new Work.
3. New pre-engineered metal building construction for labs and classrooms, associated sitework, new mechanical, electrical, plumbing systems, and associated equipment; coordination and supervision of the entire project; and all related work.
4. Site maintenance.
5. Coordination of the Work of the project.

    a. Coordination and cooperation with other contractors on site, installing Owner furnished items shall be required.

C. Summary by References: Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions (if any), the Project Manual, Technical Specification Sections, Drawings, Addenda and modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and the Drawings, and including but not necessarily limited to printed material referenced by any of these. It is recognized that the Work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions, and other forces outside the contract documents.

D. Abbreviated Written Summary: Briefly and without force and effect upon the contract documents, the Work of the Contract can be summarized as follows:

1. Refer to Paragraph 1.2-B above.

1.3 CONTRACTOR USE OF PREMISES:

A. General: During the entire construction period the Contractor will generally have exclusive use of the premises for construction operations, including full use of the site as shown on the Drawings.

1. Limitations of exclusive use of the site:

a. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to applicable rules and regulations affecting the work while engaged in project construction. See site plan for egress and ingress to site, or if not indicated, same shall be as designated by the Owner.

b. Keep existing public roads, driveways and entrances serving the premises clear and available at all times. Do not use these areas for parking or storage of materials. Remove dirt, mud, debris, etc., from site, sidewalks, streets, and public right-of-way as it occurs.

c. 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 in a fully bonded and insured facility acceptable to the Owner, with all items stored clearly identified as being assigned to this project.

d. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running, or the ignition key in place.

e. The Owner, and their representatives, the Architect and their Consultants, as well as authorities having jurisdiction will require site accessibility for inspections, observations, and perhaps other purposes, related to the planned new construction. The Contractor shall assist in such accessibility, to at least the point of providing and maintaining reasonably accessible dry paths to work in progress.

f. Provide secure temporary barricades, fencing, etc., as indicated or otherwise required, to restrict pedestrian and vehicular traffic from construction operations, including in part, Owner's staff, the public, students, children, and users of the immediately adjacent facilities.

g. Minimum construction fencing required shall be at locations indicated on the Drawings, or if not indicated, as required by the Contractor and with gates as required by the Contractor and/or authorities having jurisdiction, and all related safety and warning signs, etc. Removal of any temporary fencing, refilling post holes, etc., shall also be the responsibility of the Contractor.

h. Construction operations shall not effect in any manner, the on-going operations of the Owner, immediately adjacent facilities, adjacent property owners or businesses, or others.

i. Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain. Coordinate with authorities having jurisdiction for any work required in public right-of-ways.

j. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representatives named in the front of this Project Manual, Consultants employed, inspecting authorities with jurisdiction, and the Architect. In no instance shall this project be discussed with others, except as may otherwise be indicated herein.

k. Parking on-site, if any, shall be limited to the "staging areas" indicated on the Drawings, or if not indicated, as mutually agreed between the Owner, Architect, and Contractor at the Pre-Construction Conference.

l. Smoking or other use of tobacco products shall not be permitted within the Owner's facilities or on roofs.

m. The use or presence of alcohol and/or other debilitating substances shall not be permitted on the project site.

n. Firearms and/or other weapons shall not be permitted on the project site.

END OF SUMMARY OF THE WORK

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01015

SPECIAL CONDITIONS

1.1 TIME FOR COMPLETION OF WORK:

A. The Contractor may proceed to award sub-contracts, assemble materials, etc., at any time after award of Contract and "Notice To Proceed" with Work is given by the Owner. The contractor's official time for construction to start on work shall be the date of the Owner's "Notice to Proceed" with Work; and completion of the Work shall be within the stipulations indicated and the number of consecutive calendar days or by the date(s) indicated on the Contractor's Proposal Form.

1. Properly supervised work, per requirements, will be permitted on Saturdays and Sundays, subject to at least 72 hours prior notice and approval of the Owner.
2. Work will not be permitted during the schools SAT, achievement testing, and/or graduation examination time periods. The Contractor shall coordinate timing of testing and any other special activities with the Owner.

B. Acceptance of the completed Work of this Contract will be at a single date, and not in phases, unless otherwise indicated.

C. Nothing in the Contract Documents shall permit or be construed to permit payment to the Contractor for any extended overhead or profit due to completion of the project extending beyond the Contractual completion date. In no event shall the Owner or Architect be liable to the Contractor for damage due to any delay to any portion of the Work of this Contract.

D. Delays of exterior work due to inclement weather will be considered, only if the number of rain days is in excess of the National Weather Service 5-year average for this project's location, and proof of same is submitted along with any such claim.

1. On-site records of daily rain and/or temperature readings kept by the Contractor may be accepted to verify weather and/or temperature variations which prevent exterior work and/or roofing materials installation.

1.2 LIQUIDATED DAMAGES:

A. Actual damages for delay in completion may be impossible to determine, and the Contractor shall be liable for and the Owner shall deduct as liquidated damages from the final payment due the Contractor, the following, as a mutually agreed to and fixed amounts, **in addition to the amount indicated in Paragraph 49 of "General Conditions of the Contract"**:

1. For each calendar day of delay in completion of any part of the work beyond the number of days specified, the sum of **$200.00**.
2. In the event that work on this project is incomplete and ongoing after the contractual completion date, beginning at ten (10) additional days thereafter, the Owner will also charge the Contractor, an additional **$200.00** per day, for the Owner's nominal reimbursement to the Architect for continued work on the project, which charges will continue until "Substantial Completion" is accomplished.

B. The submittal of a Bid and/or Proposal by any Contractor and their Subcontractors shall be construed as, in part, acknowledgment and acceptance of these provisions.

1.3 SITE RESTRICTIONS:

A. The limits of work and known restrictions are indicated on the Site Plan and various portions of the Drawings and the Project Manual.

1. Refer also to Section 01010 - "Summary of Work," for additional information.

1.4 PRE-BID CONFERENCE:

A. **A PRE-BID CONFERENCE** will be held at the same location as the bid opening, at time and date indicated on Advertisement for Bids, for the purpose of reviewing the project, touring the job site, and answering Bidder's questions.

1.5 PRE-CONSTRUCTION CONFERENCES:

A. Prior to commencing any work on the project, a pre-construction conference shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the project. Time and date of said conference shall be established by the Architect after award of construction contract.

B. Similarly, prior to commencing any major portion of the Work of the project, preconstruction conferences shall be held. Mandatory attendance will be required of the General Contractor and representative of all specialty and principal subcontractors involved in the individual major portions of project. Time and date of said conferences shall be established by the General Contractor, and the Architect, Owner, and appropriate Consultants shall be advised in writing of times and dates, by the General Contractor.

1. "Major portion" may be defined as work items for each Subcontractor working on site, and shall include in part, but not be limited to, earthwork, sitework, site utilities, concrete work, masonry, Division 5, roof framing and Division 6, insulation, roofing systems, finishes, specialties, casework, mechanical, plumbing, and electrical.

1.6 CONTRACTOR ACCESS TO SITE:

A. The Contractor will have access to the site immediately upon issuance of Notice to Proceed with work. All routes of access to the site and gate locations by the Contractor or their subcontractors, are subject to approval by Owner, Architect, and other authorities having jurisdiction. Check site plan and drawings for location of work limits. Refer to Section 01010 - "Summary of Work" and Section 01500 - "Temporary Facilities," for additional requirements.

B. The Contractor shall be required to coordinate the Work of the project with the Owner's educational activities, to the extent that the Work of this Contract has little or no effect on normal school operations.

C. Work will not be permitted during the schools SAT, achievement testing, and/or graduation examination time periods (at adjacent school). The Contractor shall coordinate with timing of testing and any other special activities with the Owner.

1.7 CONTRACTOR'S PLAN FOR CONSTRUCTION OF PROJECT:

A. Contractor shall prepare and submit to the Architect for review and approval a Bar Graph, indicating their proposed plan and sequence of operations to complete each phase of this project, on schedule as required by contract. This Bar Graph may be a simple type and is not expected to be a Critical Path graph.

1.8 CONTRACTOR JOB MEETINGS:

A. On-Site Meetings with Architect and various trades and subcontractors, shall be conducted by the Contractor as directed by Architect for purpose of furthering the progress of the work, solving construction problems, and issuing instructions.

B. Refer to "Pre-construction Conferences" paragraph above and "General Conditions of the Contract," for additional information and requirements.

1.9 STORED MATERIALS:

A. It is recognized that the size of the site is restrictive and that it may be necessary for the Contractor to store some materials for project at locations on the site, prior to removal or disposal. When such on site storage is necessary, comply with requirements of authorities having jurisdiction, including in part, on site retention of earth, storm water run-off, slopes of debris, earth, etc.

B. Store items to be incorporated in the Work in stable and secure manner, off of ground, separated by hardwood or treated wood blocking, and under cover or in storage building.

1. Any materials found stored directly on ground or paving, in standing water, etc., will be rejected, immediately removed from site, and replaced with new materials at the Contractor's expense.
2. Distribute materials around framing and the roof in such manner as to prevent any damage to structure, construction, improvements, etc.

C. Refer to Section 01010 - "Summary of Work", for additional information and requirements for any off-site stored materials.

1.10 PROTECTION:

A. The Contractor shall provide and maintain adequate and secure fencing, barricades and temporary dust partitions, where indicated, and wherever required. Building entrances and exits shall remain unobstructed at all times when buildings are occupied. Remove temporary protections when acceptable to the Owner and authorities having jurisdiction, near the date of or just prior to "Substantial Completion."

B. The Contractor shall provide suitable protection for all employees, the public, children, users of other adjacent facilities, and the occupants of existing buildings at all times during the execution of and until the completion of the Work.

1. Construction equipment shall not come in contact with or swing over existing facilities to remain, public areas, occupied buildings, right-of-ways, etc., which are to remain.

C. The Contractor shall avoid damage as a result of their operations, to the existing buildings, walks, pavement, curbs, grass, shrubbery, trees, utilities, adjoining property, etc., and shall at their own expense, completely repair any damage thereto caused by their operations. All repair work is subject to Architect's approval, and that of its Owner.

1.11 WORK LIMITS PROTECTION:

A. The Contractor shall locate all temporary buildings, storage of equipment, materials, etc., within a protected area to protect the public, students, children and others from the construction activities. Type and location of such protection shall be as indicated on the Drawings, or if not indicated, at least 6' high 11-1/2 gage chain link fence with posts no more than 10' o.c.; and gates as indicated or as proposed and furnished by the Contractor, subject to acceptance of the Architect, Owner, and authorities having jurisdiction.

1. Any such fencing shall be removed upon completion of the work of this project, removed from the site, and any post holes filled and compacted same as adjacent grade or paving, by the Contractor.
2. Responsibility and maintenance of such fencing and areas within such fencing shall be held by this Contractor beginning at the date of its erection and until its removal, close to the date of project completion.

1.12 EMPLOYMENT OF AND PAYMENT FOR TESTING SERVICES:

A. The following information regarding Employment of and Payment for Testing Services under the work of Specifications shall take precedence over any conflicting statements otherwise, which may have remained in the Project Manual after editing:

1. Initial testing required by the Contract Documents shall be provided by an independent testing agency selected and employed by the Owner.
2. Any retesting required (due to failure of initial testing to meet the requirements of the Contract Documents) shall be at the Contractor's expense.
3. Any retesting required (due to questionable materials or construction methods, for verification purposes, and etc.) shall be at the Contractor's expense when the results of such retesting indicate any work or materials do not comply with requirements of the Contract Documents. Otherwise, such retesting will be at Owner's expense.
4. Any retesting under the above provisions shall be performed by the same Owner accepted testing agency.
5. Nothing in the Contract Documents shall prevent the Contractor from performing any other or additional Quality Control testing at their own expense, to verify compliance with the Bid and Contract Documents.

B. The Contractor shall be responsible for contacting and directions to the accepted testing agency and for any follow-up communications required, for all testing required by the Contract Documents.

C. No unsuitable or unsatisfactory existing soils or building materials (other than work in Contract) shall be removed without either the presence of or concurrence of and prior approval of the Architect and the accepted testing agency, so as to assure quality of the Work is maintained, and to verify quantities of any additional work under bid "Unit Prices", for which the Contractor is due payment by the Owner.

1.13 PROHIBITED MATERIALS:

A. ASBESTOS: All materials, equipment, components, accessories, and etc., installed in the work of this contract, both field installed and bought-out manufactured items from any source shall be 100-percent free of asbestos.

B. LEAD CONTENT: All water-bearing lines, water dispensing equipment, finish materials, and paint other than exposed exterior roof flashings, shall be 100-percent free of lead.

C. CALCIUM CHLORIDE: Calcium chloride and/or derivatives or additives thereof shall not be permitted in any concrete, concrete product, grout, masonry and/or mortar.

D. ENVIRONMENTAL REGULATIONS: All materials, their application, installation, and completion, shall comply with applicable environmental regulations, including in part, erosion, air-borne contaminants, and volatile organic compounds (VOC's).

E. FORMALDEHYDE: All insulation and other products shall be 100-percent free of urea formaldehyde.

1.14 PROJECT SIGNS:

A. PROJECT SIGN: Provide project sign as required by the General Conditions. Refer to Detail of Project Sign.

B. Provide, securely install and maintain prefinished metal signs on each side of each gate leaf and at 50'-0" o.c. maximum on street/public side of all construction fencing provided (if any).

1. Copy: "NO TRESPASSING
DANGER
CONSTRUCTION AREA"

2. Size: Approximately 1'-6" wide x 1'-0" high.

C. Provide other pedestrian and vehicular signs as necessary and required, in compliance with requirements of authorities having jurisdiction. Signs shall remain on site for duration of this Contract.

D. General Contractor may have a sign on their Construction Office and as needed for delivery directions only.

E. Subcontractors will not be allowed to post signs.

1.15 EXPERIENCE, PERSONNEL AND SUPERINTENDENTS:

A. General Contractors and Subcontractors shall have no less than **5-years** verifiable commercial experience in their trade and no less than **5-years** verifiable commercial experience in their business enterprise contracting for work under this project; The type of work contracted or subcontracted for this project shall be the principal business of the Contractor or Subcontractor, respectively.

1. In addition, the General Contractor shall have completed no less than 5 verifiable commercial projects of similar scope, extent, complexity and dollar value during the last 3 years.
2. Failure to comply with these requirements will result in rejection of non-compliant bids.

B. Superintendents and foremen, or other individual in the lead or supervisory position for any portion of the Work under this Contract shall have no less than **10-years** verifiable experience in performing the type of work they are responsible for.

1. The Contractor shall submit resumes of work and project experience for their Superintendent and foremen, as soon as possible and at least within five calendar days of receipt of the Contract to be executed for the work, for review and acceptance by the Owner and Architect.

1.16 SUBMITTALS:

A. Submittal requirements are indicated throughout the Contract Documents, and the following supplements those requirements.

1. Contractor will be required to make submittals for every item and product so indicated; Also upon request, for any additional or other item or products intended for use or incorporation in the Work.

   a. The Contractor shall submit to the Owner's Representative and Architect within 30 days of "Notice to Proceed", a complete listing of all required submittals, warranties, guarantees, close-out documents, and materials requiring extra or "attic" stock delivered to the Owner, for review and acceptance. Include for each item, the anticipated date of Submittal to the Architect. Re-submit until accepted or approved.
   b. NOTE THAT RECEIPT OF THIS LIST BY THE ARCHITECT IS PREREQUISITE TO PROPER PROCECESSING, REVIEW AND RETURN OF SUBMITTALS, AS INDICATED IN GENERAL CONDITIONS AND THE FOLLOWING PARAGRAPHS.

2. The Contractor shall review, mark all necessary changes, revisions, and questions; and then stamp, sign, approve, and submit to the Architect, all Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, and shall do so with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner, or of separate contractors.

   a. The Contractor shall not make submittals to the Architect which they have not reviewed, stamped, signed and approved by the Contractor; or in such case, no action will be taken by the Owner's Representative, Architect or their Consultants regarding that or those submittals.

3. In general, the Contractor shall submit 4-more copies for review than he needs returned. These copies will be retained for the Owner's Representative, Architect, Owner, and the appropriate Consultant.

a. In general, review time will be limited to two weeks for individual submittals, except for more complex submittals, such as Structural, Division 15 and Division 16.
b. NOTE: Submittals held and submitted in bulk (i.e.: 3 or more submittals) by the Contractor, shall be prioritized by the Contractor as to their importance and order in which they need to be reviewed. Such bulk submittals will be reviewed as soon as possible, but will not and cannot be reviewed simultaneously in two weeks.
c. Colors will not be selected until most or all submittals required have been received and reviewed.
d. The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and ONE (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner, after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum, amounts due to the Architect for evaluation of such additional resubmittals.

4. Submit no less than 4-each of any sample or color chart which is required or otherwise requested.
5. Submit test reports as required or otherwise requested, in the same quantity as other submittal data.
6. Contractor shall distribute reviewed submittals to all concerned and appropriate Subcontractors and Suppliers.

a. Contractor shall maintain 1-set of reviewed submittals at their on site job office.

B. Review and/or approval of submittals by the Owner's Representative, Architect, Owner and/or their Consultants shall not relieve the Contractor of their responsibility to comply with the requirements of the Contract Documents.

1. Any proposed change in the Work shall be submitted separate from any other item during construction, with same documentation as pre-bid requests, or they will not be considered.
2. No actual or proposed change shall be included in Shop Drawings or other Construction submittals, and none so included will be considered approved under any circumstances.
3. Shop Drawings are communications between the Contractor and various suppliers, fabricators, and subcontractors. The design professional's role is to review the drawings to answer questions that arise about design intent.
4. Even if a reviewed Shop Drawing or other Submittal has deviations from the original design and the Contract Documents, it in itself is not a Change Order and it is not, IN ITSELF, an approval of the change. Changes can only be approved by Change Order.
5. Dimensions, quantities, and coordination remain the Contractor's responsibility.

1.17 SUBSTITUTIONS, PRE-BID QUALIFICATIONS AND PRE-QUALIFIED SUPPLIERS:

A. Several areas of the Bid and Contract Documents pre-qualify suppliers, manufacturers, and/or products, subject to compliance with requirements also stated.

B. Acceptance of additional suppliers, manufacturers, and/or products in such instances shall be limited to those named, unless others are properly submitted at least 10-days prior to the Bid Date and subsequently accepted.

1. Where more or less days were originally stated in individual Sections of the Project Manual, the time limits for such submittals shall be as originally stated. Where no time limit was originally stated, the above 10-day limit shall apply.
2. Acceptance will only be in writing, by letter and/or Addendum.
3. Submittals during construction other than those pre-qualified or pre-accepted will not be reviewed, but instead, returned for re-submittal, without exception.

C. A proper pre-bid submittal for "pre-qualified" or "pre-accepted" consideration and review, shall be one which includes at least the following:

1. A cover letter signed by authorized person(s) which outlines the purpose of the submittal, Architect's specifications which apply, and each variation from the original specification.
2. All current and relevant manufacturer's published data, and additional information as required so that a review can be quickly made by comparing the submittal item for item to the original specification.
3. Samples and other data as required for the original item, as a minimum.

1.18 SITE MAINTENANCE:

A. The Owner will require all mud or debris resulting from this construction to be removed from streets, sidewalks, etc., by the Contractor as it appears, one or more times daily.

B. Trash, debris, etc., must be removed from the site as Contractor's trash cans, waste receptacles, etc., are filled. Same will not be allowed to accumulate or blow around the site, within the buildings, etc.

C. The Contractor shall be responsible for maintaining existing landscaping and lawns within and below any construction fencing, for the duration of the Work of the Contract, or until any such fencing is removed.

D. Refer to Sections 01010, 01500 and other locations in the Bid and Contract Documents for additional information and requirements.

1.19 INSURANCE AND SPECIAL PROVISIONS:

A. The Contractor and their insurer, by execution of the Contract, shall waive all rights of subrogation against ***"the Owner, the Architect, and their Consultants"***, and same shall be indicated on all insurance provided by the Contractor and each Subcontractor.

B. The Contractor and their insurer, and each Subcontractor, shall name ***"the Owner, Architect, and their Consultants",*** as additional named primary insureds on all insurance provided by the Contractor and each Subcontractor, except not for "Workers Compensation and Employers Liability".

C. Refer to "General Conditions" and other portions of the Bid and Contract Documents, for additional information and insurance requirements. Note that Builder's Risk insurance is required, as described in "General Conditions".

1. Extent of coverage required and/or any approval or acceptance of the insurance carried shall not act to modify the liability of the Contractor, nor to imply that the limits, features

and/or coverages described are adequate to protect the interests or exposures of the Contractor.

D. The Contractor shall "hold harmless" and indemnify ***the Owner, Architect, and their Consultants*** from any claim or legal action resulting from any circumstances related to the Work of this project, including in part, payment of any legal or other expenses, fines, judgments, etc.

E. Insurance policies required by the Contract Documents shall not be canceled, altered, or changed, without first having given thirty (30) days written notice to the Owner, with a copy sent to the Architect, except ten(10) days written notice for non-payment of premium.

1. Copies of all policies, endorsements, and insurance certificates, including new, renewed, altered, and/or changed during this Contract shall be delivered to the Owner within ten (10) days of effective date(s), with a copy sent to the Architect, by the Contractor.

F. Refer to General Conditions of the Contract and Supplementary Conditions for additional information and requirements regarding minimum insurance and indemnity requirements.

G. Special Provision: Nothing in this or other paragraphs of the Contract Documents shall create or give to third parties any claim or right of action beyond such as may legally exist irrespective of the Contract.

1.20 ACCESSIBILITY OF ALL COMPLETED WORK:

A. All products and installations of the Work of this Contract, shall be as designed by the fabricator, manufacturer, etc., and installed by the Contractor, Subcontractors, etc., so as to provide full accessibility to the handicapped and/or disabled, unless specifically indicated otherwise. This shall include in part, the following:

1. Mounting heights of all electrical devices, switches, etc., all designated plumbing fixtures, and their operation, in all areas except mechanical and electrical rooms, and service areas which are not accessible at any time to the public or Owner's administrative (not service or maintenance) personnel.
2. Signage.
3. Door operation and hardware.
4. Elevators and chair lifts (if any).
5. Slip resistance of all completed flooring and walkway surfaces both interior and exterior.

B. Comply with the more stringent requirements of at least the following, either the latest edition or latest adopted edition of the locality, and all revisions and amendments thereto:

1. Americans With Disabilities Act of 1990 (ADA) "Accessibility Guidelines" (ADA-AG).
2. "2010 ADA Standards for Accessible Design", Published in the Federal Register September 15, 2010.
3. American National Standards Institute (ANSI), ANSI A 117.1, 2009.
4. "Uniform Federal Accessibility Standards" (UFAS);
5. International Building Code, either the latest edition or latest adopted edition of the locality as applicable at the project locale.

1.21 CONTRACTOR PROGRAMS AND CONDUCT OF PERSONNEL:

A. The Contractor shall implement programs and make literature available to all construction and administration personnel to encourage making this project a safe place to work, including in part the following requirements: A project site free of any substance abuse, which does not allow any consumption of alcohol, and which does not allow any work to be performed while under the influence of any debilitating substance.

1. The Contractor and every Subcontractor shall have as part of their personnel, safety, substance abuse prevention, and/or quality programs, mandatory drug testing at pre-employment, post-accident, and at random during employees' tenure with their firms. Each such entity shall be prepared to provide non-confidential verification to the Owner that such testing is consistently on-going, upon Owner's request for same.

B. Programs shall be as acceptable to or recommended by one or more of the following:

1. Contractor's Underwriter for Worker's Compensation or liability insurance.
2. OSHA.
3. Associated General Contractors.
4. U.S. Department of Defense, Corps of Engineers, or Veterans Administration.

C. Conduct of all personnel employed for the Work of this project shall be held to a high standard and shall not be offensive to others on or around the site, including in part, pedestrians, the public, the Owner, Owner's Consultants, etc.

1. The Contractor and their employees shall limit any discussion of the Work of this project to the Owner's representative named in the front of this Project Manual, inspecting authorities with jurisdiction, and the Architect; In no instance shall this project be discussed with others, except as may otherwise be indicated herein.
2. The Contractor's personnel and Subcontractors shall not enter the Owner's building, nor use the Owner's telephones (except in emergencies), or the Owner's restrooms.

D. The Contractor shall immediately dismiss and escort off of the project site, any personnel who are obviously under the influence of alcohol or other debilitating substance, and any personnel exhibiting offensive behavior as described above or by law or by local statute or regulations of authorities having jurisdiction.

1.22 CONTRACTOR'S DAILY REPORTS:

A. General Contractor to provide a Daily Activity Log for activities performed during the work week. These logs shall be sent at the end of the week to the Owner's Representative. The Contractor shall include the following information: the workers on site, the activities occurring each day by all trades / subcontractors, any delivery of materials, the weather for the day, as well as, any delays incurred. Provide a detailed explanation and time impacted if a delay occurred during the day.

1.23 CONTRACTOR'S SECURITY CLEARANCE:

A. General All Contractor and Subcontractor personnel must have a security clearance through NCIC prior to working within a correctional institution. This typically takes one week to process. ADOC will need the following from each person:
a. Full Name
b. The last four digits of their Social Security Number
c. Date of Birth
d. Driver's License Number and State Issued

e. Gender

B. The attached NCIC security clearance excel form shall be used for every project. It is the General Contractor's responsibility to fill out the form using the excel software program. After the information has been entered, the Contractor shall submit the document directly to:

ISTC Staff Mark Matthews at Mark.Matthews@istc.edu

Put in the subject line: **CONTRACTOR'S BACKGROUND CHECK INFORMATION**

1.24 BOYCOTT CLAUSE:

A. In compliance with Act 2016-312, the contractor shall state in their contract, certifying 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.

1.25 IMMIGRATION LAW:

A. The contractor shall state in their contract, certifying 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.

1.26 SPECIAL INSTRUCTIONS

A. The Alabama Community College System (ACCS) shall be in control of the project drawings, project manual and project contracts.

END OF SPECIAL CONDITIONS

THIS PAGE INTENTIONALLY LEFT BLANK

FORM A

CONTRACTOR'S INFORMATION FOR BACKGROUND CHECK

I am requesting you to run a Criminal History, Driver's History and a Wanted Person's Check on the below listed Contractor(s).

Signed _____ Date _____ Time _____

Business Name	First Name	Middle Name	Last Name	Date of Birth	Full S S #	State/Driver's License #	Gender
Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8

It is the General Contractor's responsibility to fill out the form using the Excel software program. After the information has been entered, the Contractor shall submit the Excel Worksheet directly to:

Warden Frank Albright at frank.albright@doc.alabama.gov

Carbon copy the email to: Ken Smith at ken.smith@doc.alabama.gov

Johnny Rush at johnny.rush@doc.alabama.gov

Jenny Abbott at jenny.abbott@doc.alabama.gov

Daphne Smith at daphne.smith@doc.alabama.gov

Put in the subject line: **CONTRACTOR'S BACKGROUND CHECK INFORMATION**

SECTION 01020

ALLOWANCES – AID TO CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1. Coordinate allowance work with related work to ensure that it is completely integrated and interfaced with related work.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work, and further requirements thereof (if any) will be issued by change order.

B. Types of allowances scheduled herein for the work included the following:

1. Unit cost allowances.
2. Lump sum allowances.

C. Selection and Purchase:

1. At earliest feasible date after award of Contract, advise Architect/Engineer of scheduled date when final selection and purchase of each product or system described by each allowance must be accomplished in order to avoid delays in performance of the work.

2. As requested by the Architect/Engineer, obtain and submit proposals for the work of each allowance for use in making final selections; include recommendations for selection which are relevant to the proper performance of the work.

3. Purchase products and systems as specified, and as selected (in writing) by the Architect/Engineer.

4. Submit proposals and recommendations, for purchase of products or systems of allowances, in form specified for change orders.

D. Change Order Data: Include in each change order proposal both the quantities of products being purchased and unit costs, along with total amount of purchases to be made. Where requested, furnish survey-of-requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, amounts of applicable trade discounts, and other details as requested by the Architect.

1. Each change order amount for allowances shall be based on the unit price difference between the actual purchase amount and the allowance, multiplied by the final measure or count of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.

2. Include overhead and profit separately, in the Contractor's Base Bid, and not as part of Allowances.

3. When requested, prepare explanations and documentation to substantiate the quantities, costs, and margins as claimed.

E. Allowance Mark-Up:

1. The contractor shall add a contingency allowance of $50,000 to the base bid. Add 10% to $50,000 for overhead and profit. Credit shall be given back to the Owner at the end of the project if contingency allowance is not used. Credit must include the 10% overhead and profit.

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

3. The contractor shall include a line item in the Schedule of Values entitled "Aid to Construction Allowance" with the scheduled values to include the 10% overhead and profit. The estimated value of work completed pursuant to fully executed Allowance Authorizations may be included in the Contractor's monthly Application for Payment. Payment under this Contingency Allowance shall not exceed the net total of fully executed Contingency Allowance Authorizations.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES:

A. Allowance No. 1 – AID TO CONSTRUCTION ALLOWANCE:

1. Allow a lump sum amount for an allowance to be used as directed in writing by the Architect and Owner, including purchase of related installation items, any applicable taxes and fees, installation, and all related costs. Any amount not utilized during the construction shall be credited back to the Owner through a formal change order.

Total Contingency Amount to be included in Base Bid = $ 50,000.00

END OF ALLOWANCES

SECTION 01026

UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY:

A. This Section specifies administrative and procedural requirements for unit prices.

1. A unit price is an amount proposed by Bidders, as a price per unit of measurement for materials and/or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased, in accordance the General Conditions and/or other provisions of the Bid and Contract Documents.

2. Unit prices shall include all necessary material, labor, fees, layout, supervision (field and home office), general expenses, insurance, bonds, overhead, profit and applicable taxes, for unit item of work in place.

3. Refer to other Division 1 Sections and individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of approval, verification, measurement and payment for unit prices are specified in those sections.

B. Related work specified elsewhere includes:

1. Section 01015 - “Special Conditions”
2. Section 02110 - “Site Clearing”
3. Section 02200 - “Earthwork”
4. Section 02900 - “Landscape Work”
5. Section 03310 - “Concrete”

C. Schedule:

1. A “Unit Price Schedule” is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.

2. The Owner reserves the right to reject the Contractor’s measurement of work-in-place that involves use of established unit prices, and to have this work measured by an independent surveyor acceptable to the Contractor at the Owner’s expense.

PART 2 - PRODUCTS

2.1 Not Applicable.

PART 3 - EXECUTION

3.1 ITEMIZED UNIT PRICE SCHEDULE:

A. Item No. 1 - Mass Earth Excavation:

1. Description: Remove and dispose of unsuitable earth, as directed, including earth not needed or not suitable for reuse, encountered in open excavations, in accordance with Section 02200 - "Earthwork."

2. Unit of Measure: Cubic yard (CY) of earth excavated.

B. Item No. 2 - Trench Earth Excavation:

1. Description: Remove and dispose of unsuitable earth, as directed, including earth not needed or not suitable for reuse, encountered in trenches, in accordance with Section 02200 - "Earthwork."

2. Unit of Measure: Cubic yard (CY) of earth excavated.

C. Item No. 3 - Hand Earth Excavation:

1. Description: Remove and dispose of unsuitable earth, as directed, including earth not needed or not suitable for reuse, which must be excavated by hand, in accordance with Section 02200 - "Earthwork."

2. Unit of Measure: Cubic yard (CY) of earth excavated.

D. Item No. 4 - Additional Soil:

1. Item No. 4a - Topsoil:

a. Description: Provide additional topsoil from on-site locations, as directed, in accordance with Section 02200 - "Earthwork", Section 02900 - "Landscape Work", and applicable portions of other sections.

b. Unit of Measure: Cubic yard (CY) of topsoil, in place.

2. Item No. 4b - General or Open Site Areas:

a. Description: Provide acceptable earth fill in general or open site areas, as directed, compacted to meet requirements specified for the affected area, in accordance with Section 02200 - "Earthwork."

b. Unit of Measure: Cubic yard (CY) of fill, in place.

3. Item No. 4c - Trench Backfill:

a. Description: Provide acceptable backfill in trenches, as directed, compacted to meet requirements specified for the affected area, in accordance with Section 02200 - "Earthwork."

b. Unit of Measure: Cubic yard (CY) of backfill, in place.

4. Item No. 4d - Select Fill - On-Site Source:

a. Description: Provide acceptable select fill obtained from on-site locations, as directed, compacted to meet the requirements specified for the affected area, in accordance with Section 02200 - "Earthwork."

b. Unit of Measure: Cubic Yard (CY) of fill, in place.

5. Item No. 4e - Select Fill - Off-Site Source:

a. Description: Provide acceptable select fill obtained from off-site locations, as directed, compacted to meet the requirements specified for the affected area, in accordance with Section 02200 - "Earthwork."

b. Unit of Measure: Cubic Yard (CY) of fill, in place.

E. Item No. 5 - Rock, Masonry, or Concrete Excavation in Trenches and Pits:

1. Description: Remove and dispose of rock, masonry, and/or concrete, as directed, encountered in trenches and pits, below elevations indicated, in accordance with Section 02200 - "Earthwork".

2. Unit of Measure: Cubic Yard (CY) of rock, masonry, or concrete excavated.

F. Item No. 6 - Rock, Masonry, or Concrete Excavation in Open Excavations:

1. Description: Remove and dispose of rock, masonry, and/or concrete encountered in open excavations, as directed, below elevations indicated, in accordance with Section 02200 - "Earthwork".

2. Unit of Measure: Cubic Yard (CY) of rock, masonry, or concrete excavated.

G. Item No. 7 - Geotextile Stabilization Fabric:

1. Description: Provide geotextile stabilization fabric as directed, including materials, installation, etc., in accordance with product manufacturer's current written instructions and recommendations, and in accordance with ALDOT Standard Specifications, latest edition.

2. Product/Manufacturer: Provide acceptable equivalent to AMOCO 2000 (Propex 135ST), as manufactured by Propex Fabrics, Inc.; Austell, GA; Phone: 1-800-445-7732; including all accessories, anchors, etc., for complete and proper installation.

3. Unit of Measure: Square yard (SY) of geotextile stabilization fabric, in place.

H. Item No. 8 – Crusher Run Stone:

1. Description: Provide additional crushed stone, No. 57, or No. 67, or an ALDOT acceptable blend, as directed, including installation and compaction, in accordance with ALDOT Standard Specifications, latest edition, and Section 02200 - "Earthwork".

2. Unit of Measure: Ton (TON) of crushed stone, in place.

I. Item No. 9 - 4" PVC or HDPE Underdrain:

1. Description: Provide additional underdrain system and piping, as directed, including excavation, installation, connection to other storm drainage or to outlet, backfill, maintenance, etc., in accordance with Section 02720 - "Storm Drainage".

2. Unit of Measure: Linear foot (LF) of pipe, in place.

J. Item No. 10 - Erosion Control Fabric for Slope Stabilization:

1. Description: Provide erosion control fabric for slope stabilization fabric as directed, including materials, installation, etc., in accordance with product manufacturer's current written instructions and recommendations, and in accordance with ALDOT Standard Specifications, latest edition.

   a. Note that erosion control fabric is in addition to seeding and mulching.

2. Product/Manufacturer: Provide acceptable equivalent to "Antiwash/Geojute", as manufactured by Belton Industries, Inc.; Norcross, GA; Phone: 1-800-225-4099 or (770) 248-1927; including all accessories, anchors, pins, etc., for complete and proper installation.

3. Unit of Measure: Square yard (SY) of erosion control fabric, in place.

K. Item No. 11 - Sod:

1. Description: Provide additional sod as directed, including fine grading, soil amendments, fertilizers, sod, maintenance, etc., in accordance with Section 02900 - "Landscape Work".

2. Unit of Measure: Square yard (SY) of sod, in place.

L. Item No. 12 - Concrete Mud Footings:

1. Description: Provide additional concrete mud footings, in addition to any mud footings indicated on the Drawings, as specified in Section 03310 - "Concrete", as directed, where required by the Project Geotechnical Consultant due to any existing unsuitable soils.

2. Unit of Measure: Cubic yard (CY) of concrete mud footings, in place.

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

M. Item #13 – Construction Fencing:

1. Provide and install equivalent to 48" height "Economy Barricade Fencing," as manufactured by Seton Identification Products; Phone: 1-800-571-2596; Website: www.seton.com; Complete with manufacturer's installation accessories and written installation instructions.

2. Unit of Measure: Linear Feet (LF) of construction fencing, in place.

N. Item #14 – Silt Fencing:

1. As indicated on drawings.

2. Unit of Measure: Linear Feet (LF) of silt fencing, in place.

END OF UNIT PRICES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01045

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definition:

1. "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.
2. "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.
3. Cutting and patching performed during the manufacture of products, or 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".

1.3 SUBMITTALS:

A. Procedural Proposal for Cutting and Patching:

1. 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 application, in the submittal.
2. 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.
3. List products to be used and firms that will perform work.
4. Give dates when work is expected to be performed.
5. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that work be out-of-service temporarily. Indicate how long utility service will be disrupted.
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.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. General: Except as otherwise indicated, or as directed by the Architect/Engineer, use materials for cutting and patching that are identical to specified materials. If identical materials are not available, or cannot be used, use materials that match 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.

PART 3 - 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.

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.
3. 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.

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 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.
5. Patch, repair or rehang existing ceilings as necessary or called for on plans to provide an even plane surface of uniform appearance.

3.4 CLEANING:

A. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely point, 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 CUTTING AND PATCHING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01061

REGULATORY REQUIREMENTS & TAX EXEMPTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. References, Websites for additional information and requirements:

1. Alabama Division of Construction Management, Memo on Sales Tax Certificate 10-28-2013:
http://www.bc.state.al.us/, and ADOR references included therein.

1.2 DESCRIPTION OF REQUIREMENTS:

A. This project is being bid **EXCLUDING TAXES**, and requires the Contractor comply with the requirements of Act 2013-205, which was signed into law on May 9, 2013. The Contractor and the Owner will be required to apply for Certificates of Exemption with the Alabama Department of Revenue (ADOR) which will handle administration of the Certificates. The Contractor shall account for the tax savings for Base Bid and Alternates on "Attachment C to the Proposal Form" and as otherwise may be required by the Alabama Department of Revenue during the course of the project.

B. Base Bid and all Alternate Bids ***shall exclude*** **the cost of all required taxes**, including in part, sales and use tax, and/or as otherwise required by the Alabama Department of Revenue.

C. Forms required to be completed and submitted shall be those included in the Bid and Contract Documents, those required by the Alabama Department of Revenue; and any others is required by the financing authority and/or Owner.

1. The previously used "Agency Agreement" and/or similar provisions in the Construction Contract are not required.

D. The purchase of tools, equipment and similar items, which do not become the Owner's property, are specifically excluded from the Owner's tax exemptions, and any additional exclusions as required by the Alabama Department of Revenue's Rules and Regulations for implementation of this new law.

1.3 GENERAL PROCEDURES:

A. The provisions of this Section shall take precedence over applicable portions of the Contract and Bid Documents, including in part, "Instructions to Bidders," "General Conditions of the Contract," and "Supplementary Conditions"; Unaltered provisions of those documents shall remain in effect.

B. The Contractor, subcontractors, and all material dealers are hereby made aware of the Intent of the Owner to reduce the cost of the project by the purchase of property, materials, etc., in the manner

described herein, and neither they nor the Contractor shall withhold their consent to this arrangement.

C. Administrative Costs: Any and all administrative costs incurred by the Contractor's administering the tax savings shall be considered to be included in the Base Bid Proposal and each Alternate for the Work. No additional amount shall be added to the Contract because of the service provided by Contractor in the purchase of property, materials, etc., in the name of the Contractor, Owner, or as otherwise described herein.

D. Administration: The administration of the sale and use tax savings shall be in accordance with the terms indicated. The procedure will be administered as indicated herein and as otherwise required or directed by the Alabama Department of Revenue.

E. Limitations and Liability:

1. Responsibility: The Contractor, notwithstanding this special purchase arrangement, shall select, describe, order, obtain approvals, submit samples, coordinate, process, prepare shop drawings, pursue, receive, inspect, store, protect, insure, guarantee, warrantee, provide, and otherwise be responsible for all materials and systems, the same as if this tax savings procedure were not implemented.

2. Any necessary or required Purchase Orders shall be used only for materials for the Work of this project.

3. The Contractor shall be liable for any taxes due to failure to implement this procedure and due to any unauthorized use of Purchase Orders.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF REGULATORY REQUIREMENTS & TAX EXEMPTIONS

SECTION 01095

REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Architect," "requested by the Architect," and similar phrases.

D. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, temporary storage, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer:

1. An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
2. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the

special requirements indicated, and having complied with requirements of the authority having jurisdiction.

3. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land on which the Project is to be built.

1. If areas available are not indicated, they will be as mutually agreed by Owner and Contractor at Preconstruction Conference and as modified during construction.

K. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language:

a. Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1.4 INDUSTRY STANDARDS:

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements:

1. Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
2. 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. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards:

1. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
2. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

1.5 DRAWING SYMBOLS:

A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., seventh edition.

B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.6 SUBMITTALS:

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS: Not Applicable.

PART 3 - EXECUTION Not Applicable.

END OF REFERENCE STANDARDS AND DEFINITIONS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 TEMPORARY FACILITIES:

A. Proper provision shall be made for storage of bulk materials, parking of construction vehicles and direct access to the building site as acceptable to the Owner and approved by the Architect.

1. On-site parking will be available to the Contractor with the "staging areas" indicated, or if not indicated, as agreed to and designated by the Owner.

B. Field Offices: Not Required.

C. Digital Camera: Provide no less than 5 megapixels resolution, with 5 X zoom, for daily construction documentation at the site, including flash, memory cards, charger and rechargeable batteries, standard batteries as back-up or for primary use, and all standard accessories and hardware for equipment, for complete and proper operation, and for downloading and emailing.

1.2 TOILET FACILITIES:

A. Contractor shall provide temporary toilet(s) on site for the duration of the project, for construction personnel use. They shall be enclosed weatherproof and sanitary toilets.

1. Toilet facilities in the Owner's buildings are not available to and shall not be used by the Contractor, Subcontractors, etc.

B. Maintain toilets in sanitary condition at all times. Remove outside toilets when no longer required, and leave site in clean condition.

C. Conform to local ordinances and regulations.

1.3 TEMPORARY TELEPHONES:

A. Provide telephone for Contractor and Architect in any Contractor's job office at the project site, **and** provide a portable or cellular telephone to the Contractor's Superintendent. Cost of service and local calls shall be paid by General Contractor. Long distance and toll calls shall be paid by the party making such calls.

B. Provide telephone answering machine or service (or "voice mail" for cellular phone), to facilitate communication with the Contractor's Superintendent.

C. The Owner's telephones are not available to and shall not be used by the Contractor, except in an emergency situation.

1.4 TEMPORARY BARRIERS AND FENCES:

A. Contractor shall provide and maintain adequate fencing, barricades and protective walkways where required to provide suitable protection for employees, children, and the public at all times until completion of the work, acceptable to authorities having jurisdiction.

B. The Contractor shall confine the activities of work on this project to within the protected areas, unless otherwise directed by the Architect or Owner.

C. Refer to Section 01015 - "Special Conditions," and the Drawings, for additional requirements for temporary fencing and gates, signage, and related requirements.

1.5 ELECTRIC POWER:

A. The Owner will provide electric service for reasonable use, as necessary for this project and any demolition and/or construction to continue without interruption, to the extent it is available at the site, and shall pay the power bills for such use for the duration of the Work of this Contract.

1. Otherwise, the Contractor shall obtain the service from the local power company. Cost of temporary power from the local power company and related billings shall be paid by the Contractor from their Contract amount.

B. Use of Owner's existing on-site power service shall be limited to 110V/120V hand tools, lighting, or other use acceptable to the Owner.

C. Where need for electricity exists for use of other than 110V/120V hand tools or lighting, the Contractor shall provide temporary non-vibrating or vibration isolated portable generator with muffler in compliance with local noise ordinances, or other acceptable power source.

D. The Contractor shall be responsible for all extensions, connections, etc., as necessary for the Work. Contractor shall remove all temporary wiring, extensions, connections, etc., prior to Substantial Completion.

E. The Contractor shall protect the Owner's systems from outage or damage, and repair of any damage to at least its previously existing condition - subject to the Owner's approval.

1.6 WATER:

A. The Owner will provide water for reasonable use, as necessary for this project and any construction, and/or demolition to continue without interruption, to the extent it is available at the site, and shall pay the water bills for such use for the duration of the Work of this Contract.

1. Otherwise, the Contractor shall obtain the service from the local utility company. Cost of temporary water from the utility company and related billings shall be paid by the Contractor from their Contract amount.

B. The Contractor shall provide temporary stub-up, hose bib, etc., as necessary for the Work. Contractor shall remove all temporary piping, valves, etc., prior to substantial completion.

C. The Contractor shall protect the Owner's water systems, new and temporary water lines, valves, etc., from freezing, damage and contamination, and repair of any damage to the Owner's water systems to at least its previously exiting condition - subject to the Owner's approval.

1. Where new water service is indicated to be installed, the Owner will pay for reasonable use of water from this new source. However, the Contractor shall be responsible for any and all costs associated with the procurement and installation of any new meters, all fees for service connection, permits, tap fees, impact fees, etc., and pay for same from his/her Contract amount.

1.7 TEMPORARY HEAT:

A. Contractor shall furnish temporary heat as required for uninterrupted construction and other operations, protection of new work, for drying out buildings, etc.

1.8 ENCLOSURES AND PROTECTION:

A. Provide and maintain for the duration of construction of scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges and other temporary construction necessary for proper completion and observation of the work, in compliance with pertinent safety and other regulations, and authorities having jurisdiction. Refer to Section 01015 - "Special Conditions," and the Drawings for additional information and requirements.

1.9 CLEAN UP:

A. The Contractor or his agent, upon completion of the work shall immediately remove all temporary fences, temporary utility lines, debris or any other obstructions and leave such property in as good a condition as it was before such work was commenced.

B. The Contractor, upon completion of the work, shall remove all other temporary structures and facilities from the site.

C. The Contractor shall legally dispose of all trash, debris, etc., off site, on a regular basis.

D. Items salvaged by Contractor for his own purposes or for the Owner where indicated, may be stored temporarily on site and removed as soon as possible, unless directed otherwise by Architect, or Owner.

1. The sale or advertising for sale of salvaged or other materials *shall not be permitted* on site under any circumstances.

E. Control dust on site and clean mud and/or debris from on site and city streets and sidewalks, as it occurs.

F. Maintain new landscape work, as well as shrubs and trees to remain, including trimming and raking leaves. Keep grass and weeds cut around fencing, and within the project site.

END OF TEMPORARY FACILITIES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions:

1. Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.
2. Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 16.
3. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates, if the Work is to be completed in phases. This time variation, if any, shall be applicable to the other provisions of this section.

1.3 PREREQUISITES TO SUBSTANTIAL COMPLETION:

A. General: Complete the following before requesting the Architect/Engineer's inspection for certification of substantial completion, either for the entire Work or for portions of the Work, if the Work is to be completed in phases. List known exceptions in the request.

1. Inspection Procedures:

a. The CONTRACTOR shall conduct their own complete Prefinal Inspections, distribute punchlists to all trades, the Owner, Architect and their Consultants, and complete all resulting work items, prior to any Final Inspection by the Architect or their Consultants.
b. Following the Contractor's completion of work resulting from their own inspection(s), and upon receipt of the Contractor's request for inspection, the Architect/Engineer will either proceed with inspection or advise the Contractor of unfilled prerequisites.
c. Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed before the certificate will be issued. The Architect/Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed.
d. Results of the completed inspection will form the initial "punch-list" for "final acceptance".

2. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.
3. Submit a statement showing an accounting of changes to the Contract Sum.
4. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
5. Obtain and submit releases enabling the Owner's unrestricted use of the Work and access to services and utilities. Where required, include occupancy permits, operating certificates, and other similar releases.
6. Deliver tools, spare parts, extra stock of material, and similar physical items to the Owner.
7. Make the final change-over of locks and transmit the keys to the Owner. Advise the Owner's personnel of the change-over in security provisions.
8. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups, and similar elements.

1.4 PREREQUISITES TO FINAL ACCEPTANCE:

A. General: Complete the following before requesting the Architect/Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.

1. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and which has been endorsed and dated by the Architect/ Engineer.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar date either as of the date of substantial completion, or else when the Owner or subsequent Contractor took possession of and responsibility for corresponding elements of the Work.
5. Submit consent of surety.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
7. Include supporting documentation for completion as indicated in these contract documents.
8. Include certified "Advertisement of Completion," including dates run and paid-in-full invoice for same.

B. Reinspection Procedure:

1. The Architect/Engineer will reinspect the Work upon receipt of the Contractor's notice that the Work, including punch-list items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.
2. Upon completion of reinspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
3. If necessary, the reinspection procedure will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS:

A. General:

1. Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various "submittals" sections.
2. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistant location; provide access to record documents for the Architect/Engineer's reference during normal working hours.

B. Record Drawings:

1. Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition. Mark-up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.
2. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
3. Mark-up new information which is know to be important to the Owner, but for same reason was not shown on either contract drawings or shop drawings.
4. Note related change-order numbers where applicable.
5. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including specifications and addenda(s), and one copy of other written construction documents such as change orders and similar modifications issued in printed for during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.

1. Upon completion of the Work, submit record specifications to the Architect/Engineer for the Owner's records.

D. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect/Engineer and the Owner's personnel, if desired, to determine which, if any, of the submitted samples that have been maintained by the Contractor during progress of the Work, are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's sample storage area.

E. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect/Engineer for the Owner's records.

F. Maintenance Manuals, Warranties, and Guarantees:

1. Unless indicated otherwise, submit one (1) original and one (1) copy of each item required by the Project Manual.
2. Furnish to Architect for review, and then to Owner, in two (2) separate sets bound in three-ring binders, permanently and clearly identifying the project and contents on front and edge.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES:

A. General Operating and Maintenance Instructions:

1. Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives.
2. As part of this instruction, provide a detailed review of the following items:

   a. Maintenance manuals
   b. Record documents
   c. Spare parts and materials
   d. Tools
   e. Identification systems
   f. Control sequences
   g. Cleaning procedures
   h. Warranties, bonds, maintenance agreements, and similar continuing commitments.

3. As a part of this instruction for operating equipment, demonstrate the following procedures:

   a. Start-up
   b. Shut-down
   c. Emergency operations
   d. Noise and vibration adjustments
   e. Safety procedures
   f. Economy and efficiency adjustments
   g. Effective energy utilization.

3.2 FINAL CLEANING:

A. General: Special cleaning requirements for specific units of Work are included in the appropriate sections of Divisions 2 through 16. General Cleaning during the regular progress of the Work is required by the General Conditions and is included under section "Temporary Facilities".

B. Cleaning: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.

C. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completion:

1. Clean the project site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas to a broom clean condition; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

D. Removal of Protection: Except as otherwise indicated or requested by the Architect/Engineer, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

E. Compliance:

1. Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
2. Where extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these materials to the Owner's best advantage as directed.

END OF PROJECT CLOSEOUT

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DOCUMENTS:

A. Maintain at least one (1) copy of all drawings, specifications, addenda, approved shop drawings, change orders, filed orders, other contract modifications and other reviewed documents submitted by the Contractor in compliance with various sections of the specifications.

1.3 IDENTIFICATION AND MAINTENANCE:

A. Each of these project record documents shall be clearly marked "Project Record Copy," maintained in good condition, available for inspection by the Architect or Owner, and not used for construction purposes.

1.4 RECORDS:

A. Mark up the most appropriate documents with permanent red ink pen or red pencil to show:

1. Significant changes made during the construction progress.
2. Significant detail not shown in the original contract documents.

B. The information given shall include, but not be limited to: The location of underground utilities and appurtenances, referenced to permanent surface improvements by dimensions(s) and description(s).

C. Keep project record documents current. Do not permanently conceal any work until the required information has been recorded.

D. As-built Drawings: At completion of project, the Contractor shall submit to Architect complete sets of marked-up Project Record Drawings, as follows:

1. One (1) Original Set.
2. One (1) set, blueline or blackline prints or copies.
3. Two (2) sets of digital copies in latest edition of ISO/Adobe compliant "Portable Document Format" ("PDF") saved as "Read Only" on compact discs (CD's), clearly and permanently labeled as to their contents. MINIMUM RESOLUTION shall be 300 dpi for small format documents and 600 dpi for large format documents ("large format" is defined as larger than 11" x 17"). Original documents which include color, colored markings, etc., shall be scanned and saved as color documents. Documents may be saved in a non-proprietary ISO compliant self-extracting compressed file format, and no documents shall be password protected. Deliver in standard CD cases or sleeves which are free of any PVC content, also clearly and permanently labeled.

E. As-built Project Manual and Specifications: At completion of project, the Contractor shall submit to Architect complete sets of marked-up Project Record Specifications, in same quantities and formats as required for the As-built Drawings.

1.5 SUBMITTALS:

A. Submit project record documents and as-built drawings within ten (10) days of acceptance of the entire completed project.

END OF PROJECT RECORD DOCUMENTS

SECTION 01732

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section requires the selective removal and subsequent offsite disposal of the following:

1. Portions of existing interior and exterior construction and improvements indicated on Drawings, and as otherwise required to accommodate new construction
2. Removal of existing improvements indicated "remove", or similar indication.
3. Removal and protection of existing fixtures, materials, and equipment items indicated "salvage," or otherwise to be re-used. Refer to other Sections of Project Manual, Section 01015 - "Special Conditions", and Drawings for additional information and requirements. **Verify with Owner items to be salvaged prior to beginning demolition work.**
4. The work described in this Section, by other referenced Sections and Regulations, and by authorities having jurisdiction, require in part, that the Contractor and any Specialty Subcontractors for removal of any mold/mildew and any hazardous materials encountered, shall be knowledgeable of and comply with current regulations regarding removal, handling, worker safety, environmental safety, and legal disposal of hazardous materials.
5. Compliance with all Federal and State regulations regarding building demolition and disposal, including in part and where applicable, any thermostats and other items containing mercury, fluorescent light bulbs, batteries, transformers, ballasts, PCB's, capture of Freon, etc.

B. Related work specified elsewhere:

1. Remodeling, construction work, and patching are included within the respective sections of specifications, including removal of materials for reuse and incorporation into remodeling or new construction, and/or delivery of salvage items to Owner at on site location indicated.
2. Relocation of pipes, conduits, ducts, and other mechanical and electrical work is specified in other Divisions, and/or indicated on the Drawings.
3. Refer to Paragraph 1.2-A above.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.

B. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations (i.e.: Work by others on behalf of the Owner, normal work of Owner's personnel and other building occupants, etc.).

C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work, with copy to the Architect.

1.4 JOB CONDITIONS:

A. Occupancy: Owner may occupy portions of the building or site immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's operations.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site *will not be permitted*.

D. Protections: Provide temporary barricades and other forms of protection to protect Contractor's and Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel and representatives to portions of building and/or site, as required.
2. Erect temporary covered passageways if required by authorities having jurisdiction.
3. Provide interior bracing or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
4. Protect from damage existing finish work that is to remain in place and which becomes exposed during demolition operations.
5. Protect floors with suitable coverings when necessary.
6. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks. Temporary exterior partitions shall be weatherproof.
7. Remove protections at completion of work.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, building egress, and other adjacent occupied or used facilities.

1. Do not close, block, or otherwise obstruct streets, walks, exit egress from building, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

G. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

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

I. Environmental Controls: Use temporary enclosures and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION:

A. General: Provide interior bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.

1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

B. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.

C. Erect and maintain dust-proof partitions and closures, as required to prevent spread of dust or fumes to occupied portions of the building. Temporary partitions in exterior openings shall be weatherproof.

D. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.

1. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown of service is necessary during changeover.

3.2 DEMOLITION:

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

1. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3 SALVAGED MATERIALS:

A. Salvaged Items: Where indicated on Drawings as "Salvage - Deliver to Owner," or similar indication, carefully remove indicated items, clean, store, and turn over to Owner and obtain receipt.

1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance, remain property of Owner. Notify Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.
2. Carefully remove, clean, and deliver to Owner items so indicated in Section 01015 - "Special Conditions" and on the Drawings.

3.4 DISPOSAL OF DEMOLISHED MATERIALS:

A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose of off site.

1. 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.
2. Burning of removed materials is not permitted on project site.

3.5 CLEANUP AND REPAIR:

A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean; vacuum carpets.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SELECTIVE DEMOLITION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 GENERAL:

A. Subsurface investigations were conducted at the site, and **Report No. GMGM220046,** dated **November 16, 2022**, was issued by:

Goodwyn, Mills and Cawood, Inc.
P.O. Box 242128
Montgomery, Alabama 36124
Phone: (334) 271-3200
Kevin W. Wales, PE

B. The investigations were performed to assist the Architect and Consulting Engineers in the design of the project and are available to the Contractor as information only.

C. The Report is attached.

D. One (1) copy of the report will be furnished to each General Contractor bidding this project and to any Plan Rooms listed.

E. Upon request, properly qualified Subcontractors for Earthwork will also be provided one (1) copy of the report.

F. The report *is not* part of the Contract Documents.

G. Interpretation:

1. All material is unclassified. The Contractor shall assume all responsibility in excavating and shall not rely on information contained in the report.

2. Bidders shall make their own investigation of subsurface conditions, for neither the Owner nor the Architect assumes responsibility for the accuracy or completeness of the information contained in the report, nor will the Owner or the Architect be responsible for the additional compensation for work performed on the basis of Bidders' assumptions based on the report.

3. Note however, it is expected that Contractors will utilize the Owner's Report of "Geotechnical Exploration" much the same as have the Architect and Engineers. However, as indicated, the Owner nor the Architect accept any responsibility whatsoever for the information contained in the report, nor for any interpretations others make based on the information contained therein.

a. In the event of unforeseen existing conditions encountered during the Work of the project, there are provisions within the Bid and Contract Documents to

compensate the Contractor for any required and properly authorized additional work.

H. Refer to other Sections of the Project Manual and the Drawings for additional information and requirements.

PART 2 - PRODUCTS

2.1 Not applicable to this Section.

PART 3 - EXECUTION

3.1 Not applicable to this Section.

END OF SUBSURFACE INVESTIGATION

New ISTC Building at Perry County Detention

UNIONTOWN, ALABAMA

November 16, 2022

REPORT OF GEOTECHNICAL EXPLORATION

Prepared By

Goodwyn, Mills and Cawood, Inc.
PO Box 242128
Montgomery, AL 36124
T 334.271.3200
www.gmcnetwork.com

GMC PROJECT NUMBER: GMGM220046

Goodwyn Mills Cawood

PO Box 242128
Montgomery, AL 36124

T (334) 271-3200
F (334) 272-1566

www.gmcnetwork.com

November 16, 2022

Ms. Hillary Morgan, AIA
GMC
2660 EastChase Lane, Suite 200
Montgomery, AL 36117

RE: REPORT OF GEOTECHNICAL EXPLORATION
NEW ISTC BUILDING AT PERRY COUNTY DETENTION
UNIONTOWN, ALABAMA
GMC PROJECT GMGM220046

Dear Ms. Morgan:

Goodwyn Mills Cawood, LLC. (Geotechnical & Construction Services Division) is pleased to provide this report of geotechnical exploration performed for the above referenced project. This report includes the results of field and laboratory testing, recommendations for foundation design, and general site recommendations.

We appreciate the opportunity to perform this study on this phase of the project for you and look forward to continued participation during the construction phase of this project. If you have any questions pertaining to this report, or if we may be of further service, please do not hesitate to call.

Sincerely,
GOODWYN MILLS CAWOOD, LLC.

Stephen W. Nickerson

Stephen W. Nickerson, PE
Geotechnical Professional

Kevin W. Wales

Kevin W. Wales, PE
Executive Vice President
Licensed Alabama 20146



TABLE OF CONTENTS **Page**

1.0 PROJECT INFORMATION AND SCOPE OF WORK 1
1.1 Project Information 1
1.2 Scope of Work 1
2.0 FIELD EXPLORATION AND LABORATORY TESTING 1
2.1 Field Exploration 1
2.2 Laboratory Analyses 2
3.0 SITE AND SUBSURFACE CONDITIONS 2
3.1 General 2
3.2 Site Geology 2
3.3 Subsurface Conditions 2
3.4 Groundwater Information 3
4.0 SITEWORK RECOMMENDATIONS 3
4.1 General 3
4.2 Sitework 3
4.3 Select Fill Placement 4
4.4 Backfilling of Utility Trenches 5
4.5 Subgrade Restoration 5
4.6 Drainage Considerations 5
5.0 STRUCTURAL RECOMMENDATIONS 5
5.1 Shallow Foundations 5
5.2 Floor Slabs 6
5.3 Seismic Site Classification 7
5.4 Below Grade Walls 7
6.0 PAVEMENTS 9
6.1 Underdrains 9
6.2 Subgrade 9
6.3 Rigid Pavement 9
6.4 Flexible Pavement 10
7.0 REPORT LIMITATIONS 11

APPENDIX:

Figure 1 – Site Location Map
Figure 2 – Site Geology Map
Figure 3 – USGS Site Map
Figure 4 – Boring Location Plan
Soil Classification Chart
Subsurface Diagram
Boring Records
Summary of Laboratory Results
Field and Laboratory Procedures

1.0 PROJECT INFORMATION AND SCOPE OF WORK

1.1 Project Information

A geotechnical exploration and evaluation have been conducted for the proposed new Vocational Education Building for Ingram State Technical College at the Perry County Detention Facility in Uniontown, Alabama. The facility is now owned by the Alabama Department of Pardons and Paroles, but the building will be built by Ingram State Technical College. The proposed new facility will consist of a pre-engineering metal building with masonry veneer.

The assumed maximum column and wall loads for the building are 100 kips and 4 klf, respectively. It is assumed the floor slabs will be loaded less than 200 psf. The maximum allowable settlement for the structure is 1 inch with differential settlement up to 0.5 inches. If the loadings assumed are higher than actual loads, GMC should be notified to verify foundation recommendations.

We have not been provided with a proposed grading plan. We have assumed that the finished floor elevation will be within +/-3 feet of the existing grades. If the actual grades are different than these assumed, GMC should be notified to provide revised recommendations.

1.2 Scope of Work

The purpose of this exploration was to perform a general evaluation of the subsurface soil conditions at the site and to provide general sitework recommendations and foundation recommendations. The scope of the exploration and evaluation included a site reconnaissance, field and laboratory testing, and an engineering evaluation of the materials encountered.

The scope of services for the geotechnical study did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring records regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

The site subsurface conditions were explored by performing eleven (11) soil test borings at the approximate locations shown on the attached Boring Location Plan (Figure 4) in the Appendix. The boring locations and depths were selected by GMC. Field-testing employed by GMC was performed in general accordance with ASTM standards or generally accepted methods.

The borings were performed using a trailer mounted drill rig equipped with a rotary head and hollow stem augers (HSA). Soils were sampled using a two-inch OD split barrel sampler in accordance with ASTM D1586 driven with a manual hammer.

2.2 Laboratory Analyses

The laboratory-testing program included visual classification of all soil samples and laboratory tests consisting of natural moisture contents, grain size analysis, Atterberg limits, and lime series tests were performed on selected samples. The laboratory-testing program was conducted in general accordance with applicable ASTM standards and the results are indicated on the Boring Records and summarized in the Appendix.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 General

At the time of this study, the site consisted of a relatively level, undeveloped, grassed area within the fenced property of the detention center.

3.2 Site Geology

Published geologic information indicates that the site is underlain by the Mooreville Chalk formation. The Mooreville Chalk is generally characterized by yellowish-gray to olive-gray compact fossiliferous clayey chalk and chalky marl which weathers to form a highly plastic clay overburden, commonly referred to as "prairie" clay soils.

3.3 Subsurface Conditions

The site was explored by performing eleven (11) soil test borings to the auger refusal depth of 13 to 21 feet below ground surface.

Surficial Material
Initially, the borings encountered approximately 2 to 3 inches of organic laden material (OLM).

Natural Material
The borings encountered medium to hard fat clay (CH) below the surficial material to a depth of feet below ground surface. The SPT N-Values material ranged from 6 to over 100 bpf.

Weathered Chalk
Following the fat clay (CH), the borings encountered weathered chalk to the auger refusal depths of 13 to 21. The weathered chalk was classified as hard fat clay (CH) with chalk fragments. The SPT N-Values ranged from 27 to over 100 bpf.

The subsurface descriptions contained herein are of a generalized nature to highlight the major soil stratification features and soil characteristics. The boring records included in the Appendix should be reviewed for specific information as to individual boring locations. The stratification shown on the boring records represents conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials, and the transition may be gradual.

3.4 Groundwater Information

Groundwater was not encountered in the borings. Groundwater will likely not hinder shallow excavations.

The approximate groundwater conditions presented in this report are the levels that were measured at the time of our field activities. It is important to note that the groundwater levels may not have stabilized in the borings. Furthermore, groundwater levels may vary due to seasonal conditions and recent rainfall.

4.0 SITEWORK RECOMMENDATIONS

4.1 General

The main development issues for this site will be handling the highly plastic expansive fat clays (CH) present at the site. Highly plastic clays (CH) have the potential of shrinking and swelling with a corresponding loss or gain in soil moisture. Such volume change can cause heave of foundations, floor slabs and pavements causing cracks and damage. We recommend that the building pad and 10-feet beyond the footprint consist of the following:

1. A minimum of 5-feet of lime modified on-site soil below the final subgrade elevation, or
2. A minimum of 5-feet of off-site, low-plasticity, borrow material below the final subgrade elevation.

4.2 Sitework

Clearing and Stripping

Sitework should begin by stripping and removing all vegetation and OLM, and below grade utilities within the proposed site location.

Fat Clay

Fat clay (CH) was encountered in the borings within the proposed building and parking areas. Plastic (fat) clays (CH) have the potential of shrinking and swelling with a corresponding loss or gain in soil moisture. Such volume change can cause settlement and heave of foundations, floor slabs and pavements causing cracks and damage. **We recommend that the building pad and 10-feet beyond the footprint consist of a 5-foot building pad constructed of lime modified on-site soil or off-site, low plasticity borrow material.**

Lime Modified Soil

The volume of lime required should be determined by laboratory testing of the final subgrade soil just prior to the beginning of lime stabilization: however, for budget proposes we estimate that approximately 60 to 70 pounds of hydrated lime per square yard per 12-inch layer of treated surface area (7%) will be required, if quicklime will be utilized, we recommend using approximately 40 to 50 pounds (5%) of quicklime per square yard per 12-inch layer. There is a mellowing time for the lime to chemically modify the clays which is typically about 72 hours which may impact the site grading schedule. We recommend that a lime series be performed during construction based on the lime source utilized by the contractor to determine the optimum lime content.

The properly stabilized, mixed and cured lime subgrade earth should be compacted to at least 98 percent ASTM D698 standard density. The next layer of fill shall begin soon after final compaction of the mixture has been completed.

Proofrolling

Once the site is at grade and prior to the placement of any new fill, the areas should be proofrolled with repeated passes of a loaded tandem axle dump truck to locate deeper soft soils. Soils that are observed to rut or deflect excessively under the moving load should be undercut and replaced with properly compacted fill. The proofrolling, undercutting, and filling activities should be witnessed by a qualified representative of the geotechnical engineer and should be performed during a period of dry weather.

Attempts can first be made to compact the problem soils. If dry weather conditions exist prior to and at the time of construction, re-compaction and densification may prove successful. The soils should be scarified and the soil moisture should be adjusted to within 3 percent of optimum moisture for low plasticity soils. Once proofrolling has been accomplished, then re-compaction of the soils may be attempted.

4.3 Select Fill Placement

Select Soil Fill Material

Select soil fill material in the building area should be placed in loose lifts not exceeding 8-inches in thickness with a maximum particle size of 3 inches. The following table summarizes the compacted fill requirements:

Location	Test Method	Compaction Required (minimum)	Moisture Content
Structural Area and 10' beyond perimeter	ASTM D698 (standard)	98 %	-/+3 percentage points of optimum moisture

Structural fill material should meet the following characteristics:

Property	Requirement
Organic Material	≤ 5%
Liquid Limit	‹ 40%
Plasticity Index	≤ 20%
Passing No. 200 Sieve	30% to 75%
Maximum Dry Density	≥ 105 lb/ft^3
Maximum Particle Size	3 inches or less

The on-site fat clays (CH) should not be used as select fill. Samples of the proposed fill materials, either from on-site or borrow, should be provided to the geotechnical engineer for Proctor testing and evaluation prior to placement. Density tests should be performed to document compaction and moisture content of any earthwork involving soils and other applicable materials. Density tests should be performed frequently, with a recommended minimum of one test per 5,000 square feet per lift of fill in structural areas and one test per

10,000 square feet per lift in other areas. Fill material must meet the specified density and moisture requirements to be considered acceptable.

4.4 Backfilling of Utility Trenches

Backfilling of storm drain and utility trenches must be performed in a controlled manner to reduce settlement of the fill and cracking of overlying floor slabs and pavements. We recommend that utility trenches be backfilled with acceptable borrow or dense-graded crushed stone in 6-inch loose lifts compacted with mechanical piston tampers to the project requirements. Should seepage occur in utility trenches, it may be necessary to "floor" the trench with dense-graded gravel to provide a working surface. If crushed stone is used to backfill utility trenches, we recommend that dense graded aggregate (DGA, compacted in lifts) be used. Open-graded crushed stone, such as ALDOT #57, can serve as a channel for seepage toward structures and therefore is not recommended for use as utility trench backfill.

4.5 Subgrade Restoration

Typically, due to the movement of heavy equipment and weather conditions, the subgrade soil becomes disturbed during construction. As a result, these soils have a tendency to lose shear strength and support capability. Therefore, additional effort on the contractor's part will be required to reduce traffic and limit disturbance of soils. It is essential that the subgrade be restored to a properly compacted condition based on optimum moisture and density.

4.6 Drainage Considerations

Adequate drainage should be provided at the site to control the moisture content of the foundation soils. We recommend that the ground surface be sloped away from the structure on all sides. Roof drainage should be collected by gutters and downspouts and transmitted by pipe to the storm water drainage system or discharge a minimum of 5 feet away from the building. Throughout the construction process, the subgrade soils adjacent to the structures should have adequate drainage to reduce saturation of the foundation soils.

We recommend that an underdrain be installed between the existing fat clay and the 5-foot prepared building pad to reduce the effects of moisture fluctuation to the building and surrounding structures. We recommend that the underdrain extend a minimum of 12-inches into the native clay layer below the planned 5-foot prepared pad and surround the building addition. The underdrain should have a minimum width of 18-inches. The components of the underdrain shall consist of a filter fabric, ALDOT #57 or #67 stone backfill, and a 6-inch perforated pipe. The underdrain shall have sufficient slope to allow the water to drain and connect a storm drain.

5.0 STRUCTURAL RECOMMENDATIONS

5.1 Shallow Foundations

Once the site is prepared as recommended, shallow foundations can be used for column loads up to approximately 100 kips or wall loads up to approximately 4 kips per linear foot that can tolerate up to 1-inch of movement. Based on the site being prepared as noted in Section 4.0, interior shallow and column footings

can be used and sized using a net allowable soil bearing pressure of 2,000 psf. The following depths should be used for the footings:

Footing Location	Bearing Depth Requirement (feet below bottom of slab)
Exterior	5
Interior	2

We recommend that CLSM, or "lean" concrete, be used from the foundation bearing surface up to approximately 2 feet below the final exterior grade and foundations constructed at that elevation. Interior column footings can be designed to bear at a nominal depth of 2 feet in the select compacted fill material. The above-noted bearing pressures may be increased by one-third (1/3) for transient loads, such as wind.

Total settlements of shallow foundations due to existing and new fill soils and building loads are expected to be approximately 1-inch, with differential settlements of approximately 0.5-inches between similarly loaded foundations. Provided the sitework recommendations are followed, we estimate the swell potential to be less than 1-inch.

Even though computed footing dimensions may be less, column footings and continuous footings should have minimum dimensions of 24 inches and 18 inches, respectively. This allows for hand cleaning of materials disturbed during the excavation process and reduces the potential for punching shear failure.

The geotechnical engineer or his representative should observe all foundation excavations. The engineer can provide geotechnical guidance to the owner's design team should any unforeseen foundation problems develop during construction. If any areas of foundation surfaces prove to be unsuitable, the foundation excavation should be over-excavated. The over-excavated area can be backfilled with "lean" concrete or controlled low strength material (CLSM) up to the planned foundation bearing depth.

Foundation concrete should be placed the same day as soon as possible so that the foundation bearing soils can remain near the existing moisture content. Foundation bearing surfaces should not be disturbed or left exposed. Saturation of the on-site soils can cause a loss of strength and increased compressibility. Drying of the soils can result in later heave of the foundations. Excavations for footings should be hand cleaned to remove any loose soil or mud from the foundation bearing surface. If construction occurs during inclement weather and concreting is not possible immediately after excavation, we recommend that a thin layer (approximately 2 inches) of lean concrete or CLSM be placed on the bearing surface for protection after we have observed and evaluated the exposed bearing surfaces. Exposed bearing soils should be compacted prior to placement of reinforcing.

5.2 Floor Slabs

It is our opinion that floor slabs can be built on-grade achieving support from properly compacted fills. For off-site select fill subgrade soils compacted to at least 98 percent of the materials standard Proctor maximum dry density, we recommend a modulus of subgrade reaction of 125 psi/in (pci).

Ground supported slabs should be founded on a minimum of 12-inches of compacted, granular material such as ALDOT 825B dense graded aggregate. Granular material should be compacted to at least 95% of the standard Proctor density (ASTM D698). This layer should provide uniform and immediate support for the slab and act as a capillary break. A vapor retarder should be used on top of the granular layer, as required by the building use.

Care should be taken so that fines from the subgrade are not allowed to contaminate the granular layer. If fines do contaminate this layer, capillary rise and subsequent damage to moisture sensitive floor coverings could occur. On most projects, there is some time lag between initial grading and the time when the contractor is ready to place concrete for the slab-on-grade. Inclement weather just prior to placement of concrete for the slab-on-grade can result in trapped water in the granular layer.

5.3 Seismic Site Classification

Subsurface information (SPT and soil classification) from the borings, published geologic information, and our experience was used to estimate the seismic site classification according to methods in the International Building Code. Based upon this information, we recommend a Seismic Class of C (Very Dense Soil and Soft Rock) for this site. Based on our understanding of the project, we have assumed a Risk Category of III. If the Risk Category is different, the values below may need to be revised. According to the ASCE 7/SEI 7-16 hazard standard information, the site has mapped 0.2 second spectral response acceleration (S_S) of approximately 0.188g and a mapped 1.0 second spectral response acceleration (S_1) of approximately 0.082g.

Using this information, Site Class C and Risk Category III, the site coefficients F_a and F_v have been determined to be 1.3 and 1.5, respectively. The design spectral response accelerations S_{DS} and S_{D1} were 0.163g and 0.082g, respectively.

5.4 Below Grade Walls

Below grade walls must be designed to resist the lateral earth pressures that will be induced by the weight of the backfill materials, hydrostatic pressures on the walls and any adjacent slab or pavement surcharge loads exerted on the walls. It is recommended that the walls be supported by footings as outlined above and backfilled with a free draining material such as crushed stone/gravel or clean sand (less than 10% passing a No. 200 sieve). A drainage system should be provided near or at the base of the walls to collect and remove groundwater or seepage and to prevent buildup of hydrostatic pressures. This should be connected to storm drains or pumped from a sump away from the structure.

Walls that support buildings or are otherwise restrained at the top should be designed for "at rest" earth pressure conditions. Walls that are free to deflect should be designed for "active" earth pressure conditions. The "passive" earth pressure state should be used for soils supporting the retaining structure, such as toe backfill. The on-site, fine-grained materials (CH) at the site should not be used as backfill immediately behind walls. Relatively free-draining crushed stone/gravel or sand should be used as backfill. The table below presents recommended values of earth pressure coefficients for the select backfill materials:

Soil Parameter	Backfill Type		
	SM, SC	GW, GP	SP, SW
Soil Unit Weight (pcf)	120	130	128
Buoyant Unit Weight (pcf)	58	68	66
Angle of Internal Friction, Φ, deg	31	39	37
At rest Pressure Coefficient, K_o	0.48	0.37	0.4
Active Pressure Coefficient, K_a	0.32	0.23	0.25
Passive Pressure Coefficient, K_p	3.12	4.4	4.02
Coefficient of Friction, tan Φ	0.6	0.8	0.7
At-rest Equivalent Fluid Pressure, pcf (Above GWT, below GWT)	58, 90	48, 88	51, 89
Active Equivalent Fluid Pressure, pcf (Above GWT, below GWT)	38, 81	30, 78	32, 79
Passive Equivalent Fluid Pressure, pcf (Above GWT, below GWT)	374, 242	572, 360	514, 326

GWT = Ground water table

Samples of all backfill material should be evaluated for use as backfill. The design values and recommendations presented above assume that the backfill behind the wall will be horizontal with no surcharge loads and that a permanent drainage system will be installed behind the retaining wall to prevent the development of hydrostatic pressures. The noted backfill should extend from the wall and upward from the top of the footing on line 35 degrees from the vertical.

For analysis of sliding resistance of the base of the retaining walls, the ultimate coefficient of friction may be taken as 0.35 between concrete and medium to stiff soil.

The soils used behind the walls should be reviewed and approved by the Geotechnical Engineer prior to their placement. **The on-site clays should not be utilized as below grade wall backfill.** Using a select material can significantly reduce the horizontal loads on the wall as well as improve the effectiveness of the wall drainage system. Compaction of backfill behind walls should be performed by appropriate manual equipment. The wall should be properly braced and heavy equipment should not be allowed behind the wall. No equipment or construction loads should be allowed within 10 feet of retaining walls or half the distance of the freestanding wall-height, whichever is less. This will help prevent any surcharge loads from adding lateral earth pressures above that previously recommended to the retaining wall.

Retaining walls should be braced during any backfilling operations and monitored for movement. If the footings construction precedes the subgrade preparation, then the footings should either be embedded below the subgrade a sufficient distance to achieve the required horizontal component or the footing should include a shear key to prevent movement.

6.0 PAVEMENTS

6.1 Underdrains

Underdrains should be installed along the pavement edges and landscaped islands. The underdrains should be installed 12-inches into the fat clay subgrade. The underdrain should exhibit a width of at least 12-inches and include a 4- to 6-inch perforated PVC drainpipe and filter fabric. The gravel and pipe should be enveloped with filter fabric. A gravity discharge to a nearby storm drainage feature should be provided if possible.

6.2 Subgrade

The final 12-inches of clay soil beneath the pavement should be improved with respect to drainage, compaction and density. Subgrade improvements should extend 10 feet beyond the paved areas, when possible. Pavement subgrade preparation should include lime stabilization. The top 12-inches of clay subgrade soil should be chemically stabilized using calcium hydrated lime (ALDOT Section 817). The volume of lime required should be determined by laboratory testing of the final subgrade soil just prior to the beginning of lime stabilization: however, for budget proposes we estimate that approximately 60 to 70 lbs. of hydrated lime per square yard per 12-inch layer of treated surface area (7%) will be required. If quicklime will be utilized, we recommend using approximately 40 to 50 lbs. (5%) of quicklime per square yard per 12-inch layer. Lime stabilization is described by ALDOT Section 232 - Class 2. Please note temperature restrictions for lime stabilization.

The properly stabilized, mixed and cured lime subgrade earth should be compacted to at least 98 percent ASTM D698 standard density. Paving, asphalt or concrete, shall begin soon after final compaction of the mixture has been completed.

Typically, during construction, the pavement subgrade becomes disturbed because of traffic and environmental conditions. Prior to construction of pavements, it is essential that the subgrade be restored to a properly compacted condition. The specifications should include notes pertaining to subgrade restoration immediately prior to pavement construction. The on-site clayey soils will have a tendency to lose shear strength (and consequently pavement support capability) if they are exposed to excessive moisture. Thus, proper moisture conditioning of the subgrade prior to placement of the pavement base course will result in better pavement performance. The pavement subgrades should be thoroughly proofrolled prior to fine grading to identify soft soils not encountered during the mass grading of the site. Those soft areas should be undercut and replaced with properly compacted fill.

6.3 Rigid Pavement

All Portland cement concrete pavements should contain 4 to 6 percent entrained air assuming the mix will contain ¾ -inch to 1-inch nominal maximum size aggregate. Concrete slump should be no more than 2 inches when placed by slip forming and no more than 4 inches for non-slip formed concrete. Minimum 28-day concrete compressive strength should be 4,000 psi and minimum flexural strength 650 psi. All rigid pavements shall be underlain by 12-inches of lime stabilized subgrade.

RIGID PAVEMENT MINIMUM THICKNESS		
Pavement Materials	Light Duty	Heavy Duty
Portland Cement Concrete	6”	8”
ALDOT Section 232 Lime Stabilized Roadbed (98% standard density)	12”	12”

Pavement joints, reinforcing, and details should be designed in accordance with the applicable American Concrete Institute (ACI) standards. Portland cement concrete pavement should meet the requirements of ALDOT Section 450.

It is our understanding that roller compacted concrete has been used on the HMMA campus for various paving areas. Roller-compacted concrete (RCC) is placed without reinforcement and typically without saw cut joints. The finished surface of the concrete typically has random cracking and is typically less than desirable appearance and in many cases is overlain by asphalt. We recommend that RCC be underlain by 12-inches of lime stabilized roadbed. In heavy duty areas, we recommend a minimum of 12-inches of RCC. In light duty areas, we recommend a minimum of 6-inches of RCC. In order to limit the appearance of reflective cracking, we recommend a minimum of 2-inches of asphalt in light duty areas and 6-inches of asphalt in heavy duty areas.

6.4 Flexible Pavement

Pavements bearing over lime stabilized soils should include the following full-depth asphalt sections:

Pavement Area	Minimum Section Thickness	Pavement Materials
Standard Duty Pavements	1.5 inches	ALDOT Section 424A Superpave Bituminous Wearing Surface
	3.0 inches	ALDOT Section 424B Superpave Bituminous Binder Layer
	12.0 inches	ALDOT Section 232 Lime Stabilized Roadbed (98% standard density)
Heavy Duty Pavements	1.5 inches	ALDOT Section 424A Superpave Bituminous Wearing Surface
	4.5 inches	ALDOT Section 424B Superpave Bituminous Binder Layer
	12.0 inches	ALDOT Section 232 Lime Stabilized Roadbed (98% standard density)

A tack coat (ALDOT Section 405) shall be placed between bituminous layers. A prime coat (ALDOT Section 401) shall be placed on the lime stabilized subgrade prior to bituminous binder layer placement. The pavement sections represent minimum recommended thickness for a pavement section designed for a 12-year life. However, periodic maintenance should be anticipated over the pavement design life. All pavement

materials and construction procedures should conform to the State of Alabama Department of Transportation Standard Specifications for Highway Construction, Latest Edition. The hot-mix asphalt should conform to Section 424 and the lime stabilized roadbed shall conform with Section 232.

7.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by GMC and design details furnished by GMC for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, we should be notified immediately to determine if changes in the foundation, or other, recommendations are required. If GMC is not retained to perform these functions, GMC cannot be responsible for the impact of those conditions on the performance of the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

We emphasize that this report was prepared for design and informational purposes only and may not be sufficient to prepare an accurate construction budget. Contractors reviewing this report should acknowledge that the recommendations contained herein are for design and informational purposes only. In no case should this report be utilized as a substitute for development of specific earthwork specifications.

The information contained in this report is not intended, nor is sufficient, to aid in the design of segmental or mechanically stabilized earth (MSE) retaining walls. Segmental or MSE wall designers and builders should not rely on this report and should perform independent analysis to determine all necessary soil characteristics for use in their wall design, including but not limited to, soil shear strengths, bearing capacities, global stability, etc.

APPENDIX

Figure 1 – Site Location Map

Figure 2 – Site Geology Map

Figure 3 – USGS Site Map

Figure 4 – Boring Location Plan

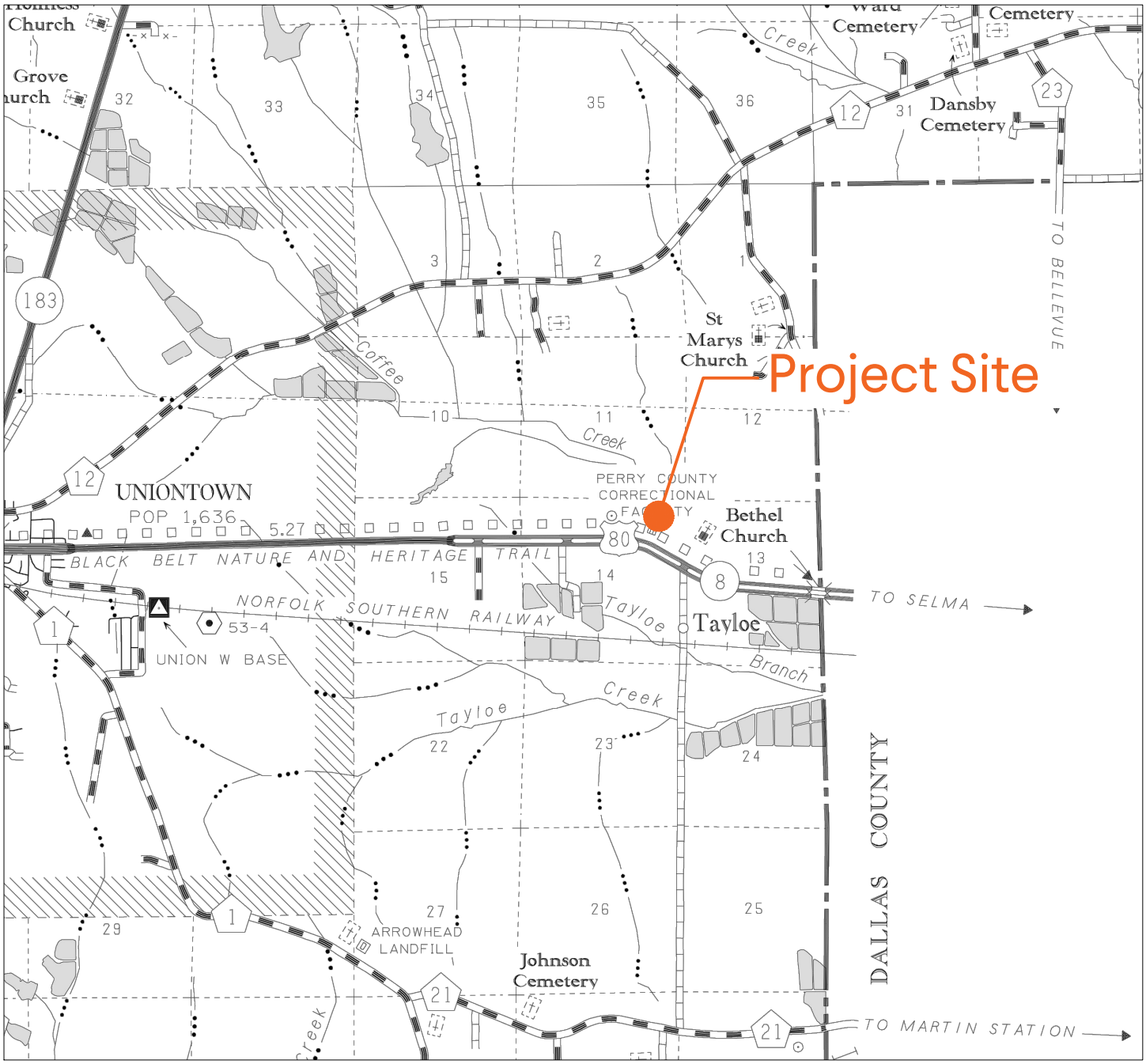
Soil Classification Chart

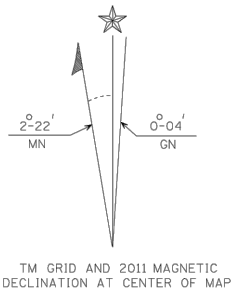
Subsurface Diagram

Boring Records

Summary of Laboratory Results

Field and Laboratory Procedures





TM GRID AND 2011 MAGNETIC DECLINATION AT CENTER OF MAP



COUNTY LOCATION

Reference: General Highway Map of Perry County, ALDOT, 2011

ISTC Building Perry County Detention Faciltiy
Uniontown, Alabama

Site Location Map

Figure 1

SUPPLEMENTAL DRAWING

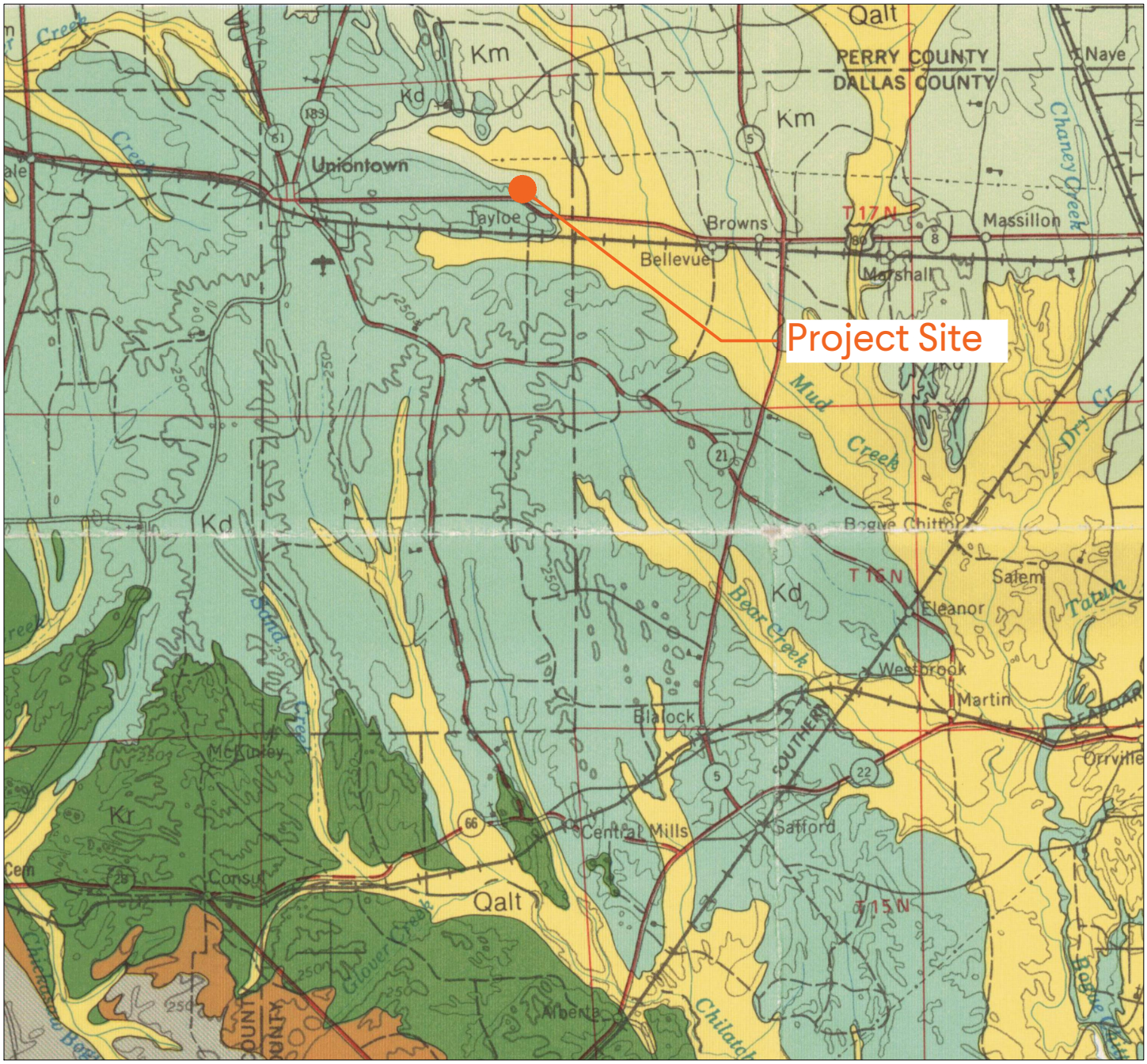
GMC # GMGM220046

11/03/2022

DRAWN BY: MJL

2660 East Chase Lane, Suite 200
Montgomery, AL 36117
T 334.271.3200
GMCNETWORK.COM

GMC



Kd — **Demopolis Chalk Formation** - Light-gray to medium-light-gray compact, brittle chalk overlain by abundantly fossiliferous chalky marl, very clayey chalk, and calcareous clay.

Km — **Mooreville Chalk Formation** - Yellowish-gray to olive-gray compact fossiliferous clayey chalk and chalky marl. The unconformable contact at the base is characterized by a bed of glauconitic, chalky sand containing phosphatic pellets and molds of fossils. The Arcola Limestone Member at the top consists of two to four beds of light-gray brittle, dense fossiliferous limestone separated by beds of light-gray to pale-olive calcareous clay.

Reference: Szabo, M.W., Osborne, E.W., Copeland, C.W. Jr., and Neathery, T.L., 1988, Geologic Map of Alabama, Geological Survey of Alabama Special Map 220

ISTC Building Perry County Detention Facility
Uniontown, Alabama

Site Geology Map

Figure 2

SUPPLEMENTAL DRAWING

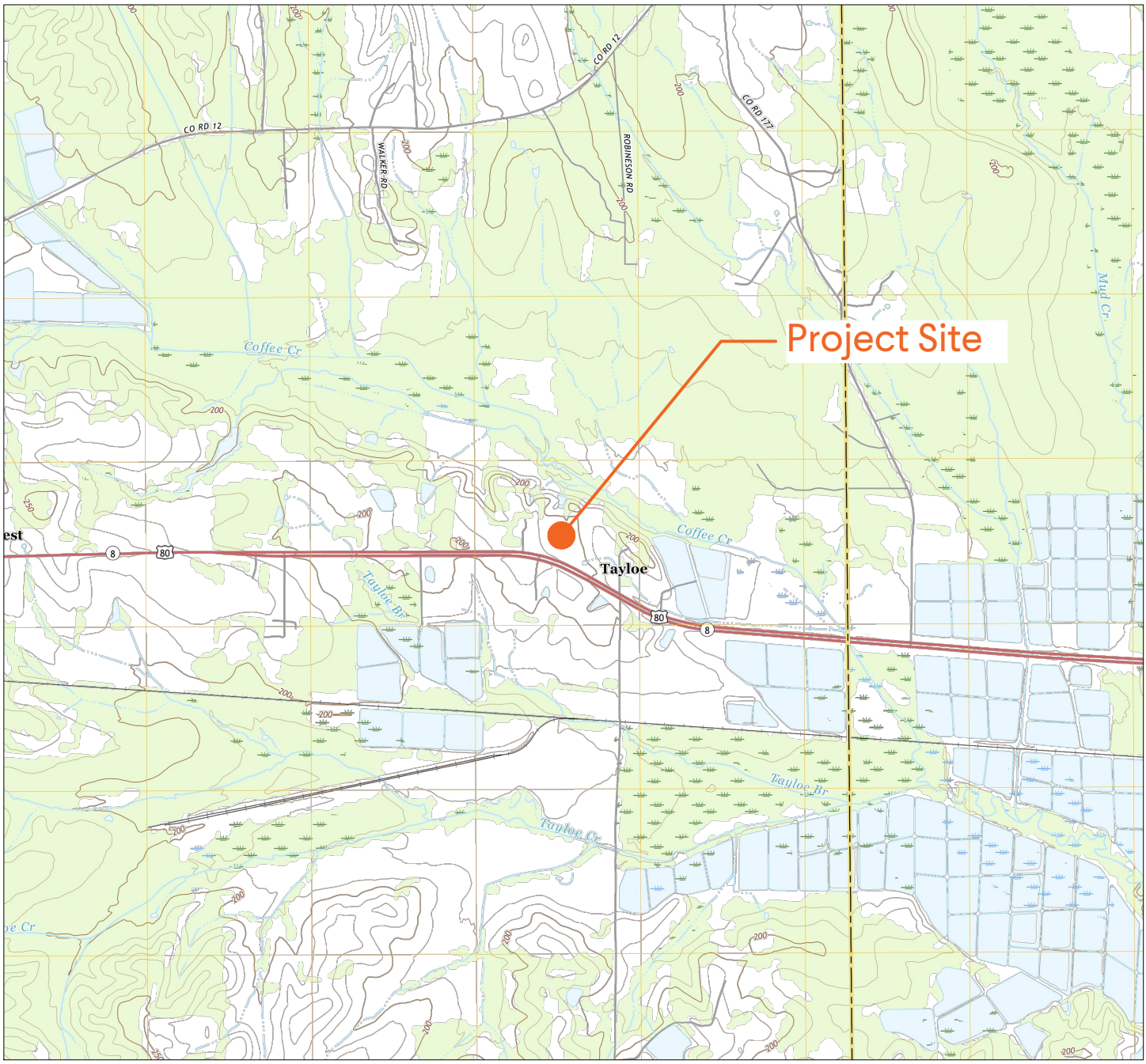
GMC # GMGM220046

11/03/2022

DRAWN BY: MJL

2660 East Chase Lane, Suite 200
Montgomery, AL 36117
T 334.271.3200
GMCNETWORK.COM

GMC



MN
GN
3°1′
54 MILS
0°14′
4 MILS

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



QUADRANGLE LOCATION

Reference: USGS Quadrangles 7.5 Minute Series (Topographic)

ISTC Building Perry County Detention Facility
Uniontown, Alabama

Uniontown East Quadrangle (2020)
USGS Site Map

Figure 3

SUPPLEMENTAL DRAWING

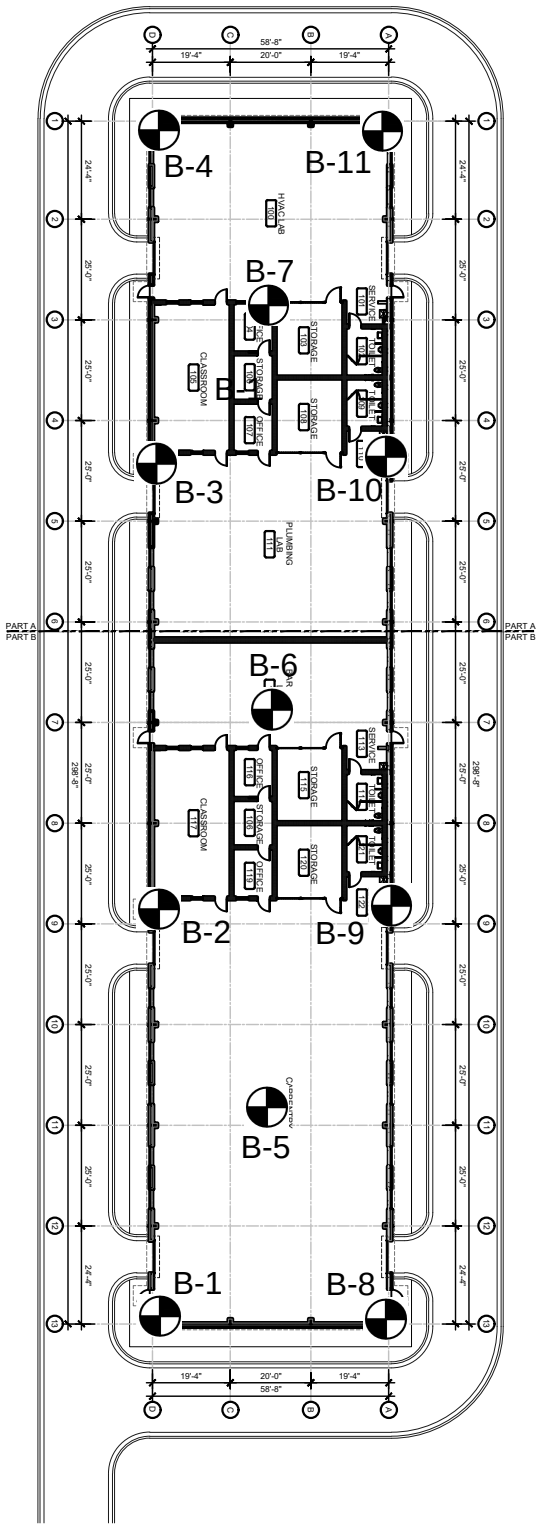
GMC # GMGM220046

11/03/2022

DRAWN BY: MJL

2660 East Chase Lane, Suite 200
Montgomery, AL 36117
T 334.271.3200
GMCNETWORK.COM

GMC



Approximate Boring Location

Reference: GMC drawing adapted from GMC Drawing A1.11 Composite Floor Plan and Floor Plan-Part A dated 10/14/2022

ISTC Building Perry County Detention Facility
Unionville, Alabama

Boring Location Plan

Figure 4

SUPPLEMENTAL DRAWING

GMC # GMGM220046

11/10/2022

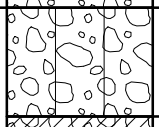
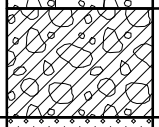
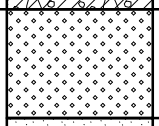
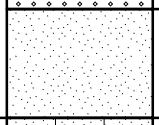
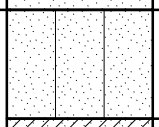
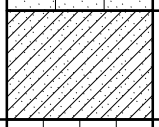
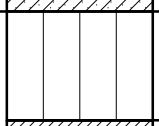
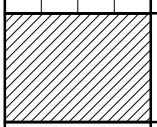
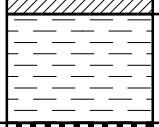
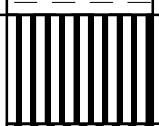
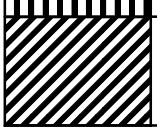
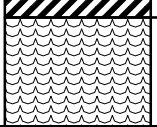
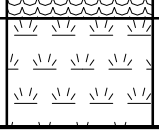
DRAWN BY: SWN

2400 5th Avenue S, Suite 200
Birmingham, AL 35233
T 205.879.4462
GMCNETWORK.COM

GMC

GMC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SUBSURFACE DIAGRAM

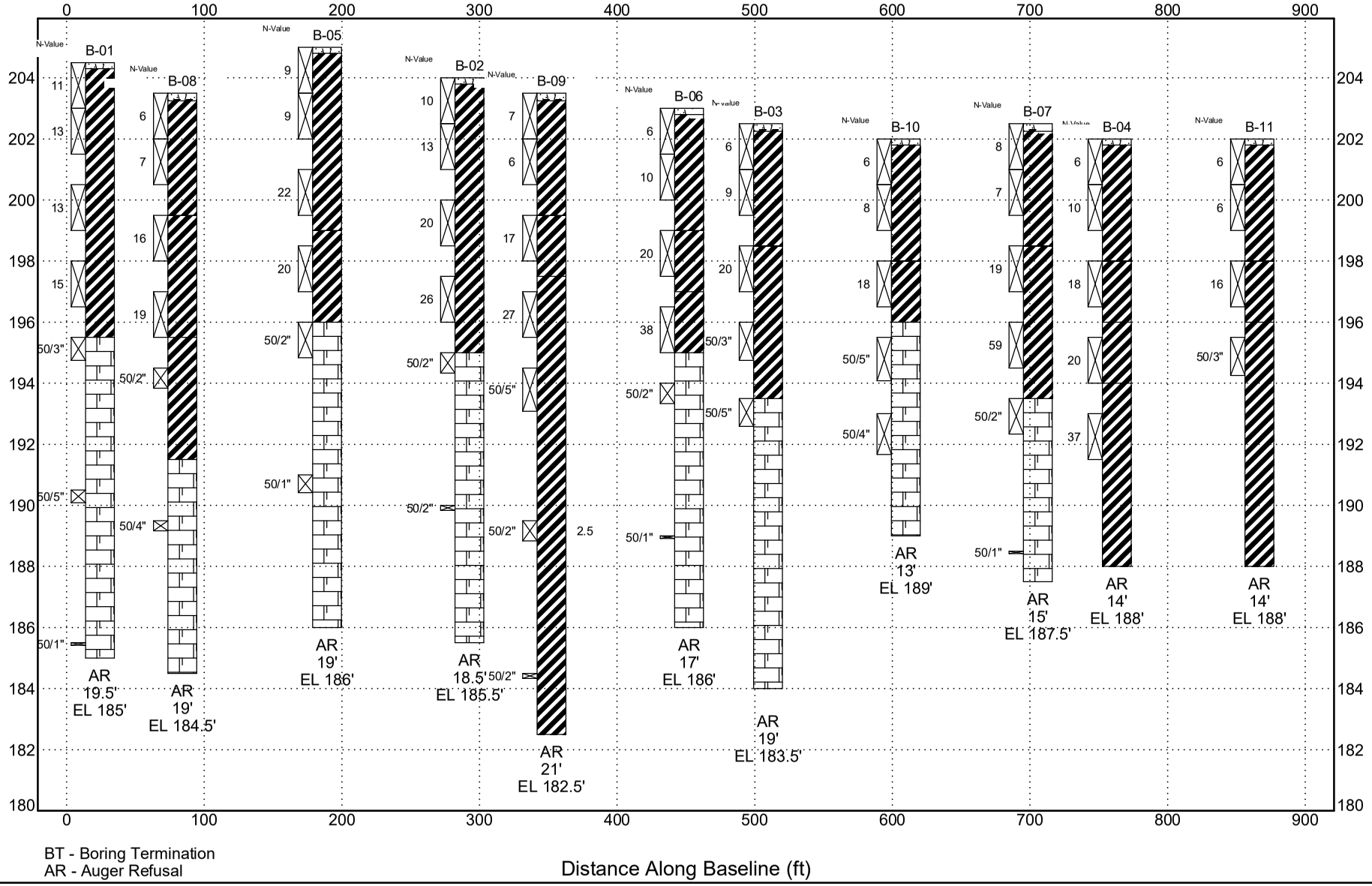
TOPSOIL | CH | CHALK

CLIENT J.F. Ingram State Technical College

PROJECT NAME ISTC Building Perry Co. Detention Facility

PROJECT NUMBER GMGM220046

PROJECT LOCATION Uniontown, Alabama



BT - Boring Termination
AR - Auger Refusal

BT-AR DEPTH+ELEV LOG GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/8/22

BORING NUMBER B-01

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 204.5 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 2"										
			FAT CLAY (CH), light gray and yellow brown with some white, stiff	SS		3-4-7 (11)	2.5						
				SS		4-6-7 (13)	2.75						
200	5			SS		3-5-8 (13)	2.75						
				SS		5-6-9 (15)	3						
195	10		FAT CLAY (CH), gray and white, hard- PARTIALLY WEATHERED CHALK	SS		26-50/3"							
190	15			SS		50/5"							
185	20			SS		50/1"							
			Auger refusal was encountered at 19.5 feet.										
180	25												
175	30												
170	35												

BORING NUMBER B-02

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 204 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 2"										
			FAT CLAY (CH), light brown and gray with some white, stiff to very stiff	SS		3-5-5 (10)	2.5						
				SS		6-6-7 (13)	4.5						
200													
	5			SS		6-7-13 (20)	4.5						
				SS		9-11-15 (26)	4.5						
195													
	10		FAT CLAY (CH), light gray and white, hard- PARTIALLY WEATHERED CHALK	SS		23-50/2"	4.5						
190													
	15			SS		50/2"							
185			Auger refusal was encountered at 18.5 feet.										
	20												
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-03

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 202.5 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 3"										
			FAT CLAY (CH), light brown and light gray, medium to stiff	SS		2-3-3 (6)	1.5						
200				SS		3-4-5 (9)	3						
	5		FAT CLAY (CH), light gray and pale yellow, slightly sandy, hard	SS		8-9-11 (20)	4.5						
195				SS		13-26-50/3"	4.5						
	10		FAT CLAY (CH), light gray and white, hard- PARTIALLY WEATHERED CHALK	SS		23-50/5"	4.5						
190													
	15												
185													
	20		Auger refusal was encountered at 19.0 feet.										
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-04

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 202 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 2"										
200			FAT CLAY (CH), light brown and light gray, medium to stiff	SS		3-3-3 (6)	1.5						
				SS		3-4-6 (10)	4.5						
	5		FAT CLAY (CH), light brown and light gray, very stiff	SS		5-9-9 (18)	3.5						
195			FAT CLAY (CH), greenish gray, very stiff	SS		6-6-14 (20)	3						
	10		FAT CLAY (CH), pale yellow and light gray, hard - weathered CHALK	SS		12-16-21 (37)	3.5						
190													
	15		Auger refusal was encountered at 14.0 feet.										
185													
	20												
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-05

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 205 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
205	0		Organic Laden Material (OLM) - 2"										
			FAT CLAY (CH), light brown and light gray, stiff to very stiff	SS		3-4-5 (9)	2.5						
				SS		4-4-5 (9)	3						
200	5			SS		6-9-13 (22)	4						
			FAT CLAY (CH), light gray and white, very stiff										
				SS		8-8-12 (20)	3.5						
195	10		FAT CLAY (CH), light gray to gray, hard- PARTIALLY WEATHERED CHALK	SS		20-31-50/2"	4.5						
190	15			SS		31-50/1"							
185	20		Auger refusal was encountered at 19.0 feet.										
180	25												
175	30												
170	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-06

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 203 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 2"										
			FAT CLAY (CH), yellowish brown and gray, medium to stiff	SS		3-3-3 (6)	1.5		26				
200				SS		3-4-6 (10)	2		24				
	5		FAT CLAY (CH), yellowish brown, gray and white, very stiff	SS		7-7-13 (20)	3.5		31				
			FAT CLAY (CH), yellowish brown and gray, hard	SS		9-17-21 (38)							
195			FAT CLAY (CH), gray, hard- PARTIALLY WEATHERED CHALK	SS		31-50/2"			20				
	10												
190													
	15			SS		50/1"							
185			Auger refusal was encountered at 17.0 feet.										
	20												
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-07

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 202.5 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 3"										
			FAT CLAY (CH), light brown and light gray, medium	SS		4-4-4 (8)	3.5						
200				SS		3-3-4 (7)	3						
	5		FAT CLAY (CH), pale yellow and light gray, very stiff to hard	SS		6-6-13 (19)	4.5						
195				SS		17-21-38 (59)	4.5						
	10		FAT CLAY (CH), gray, hard- PARTIALLY WEATHERED CHALK	SS		23-18-50/2"	4.5						
190													
	15			SS		50/1"							
			Auger refusal was encountered at 15.0 feet.										
185													
	20												
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-08

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 203.5 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 3"										
			FAT CLAY (CH), light brown and light gray, medium	SS		3-3-3 (6)	2						
				SS		3-3-4 (7)	2						
200													
	5		FAT CLAY (CH), light brown and light gray, very stiff	SS		5-7-9 (16)	3.5						
				SS		7-9-10 (19)	3.5						
195			FAT CLAY (CH), pale yellow, hard										
	10			SS		35-50/2"	4.5						
			FAT CLAY (CH), gray, hard- PARTIALLY WEATHERED CHALK										
190													
	15			SS		50/4"							
185													
			Auger refusal was encountered at 19.0 feet.										
	20												
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-09

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 203.5 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 3"										
			FAT CLAY (CH), light brown and light gray, medium	SS		2-3-4 (7)	2						
				SS		3-3-3 (6)	4.5						
200													
	5		FAT CLAY (CH), light brown and light gray, very stiff	SS		5-7-10 (17)	3.5						
			FAT CLAY (CH), dark white, very stiff to hard-weathered CHALK										
				SS		9-11-16 (27)	3.5						
195													
	10			SS		10-19-50/5"	3.5						
190													
	15			SS		13-50/2"	2.5						
185													
	20			SS		50/2"							
			Auger refusal was encountered at 21.0 feet.										
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

BORING NUMBER B-10

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 202 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 2"										
200			FAT CLAY (CH), light brown and light gray, medium	SS		3-3-3 (6)	1.5						
				SS		3-4-4 (8)	2						
	5		FAT CLAY (CH), pale yellow, very stiff	SS		6-8-10 (18)	4.5						
195			FAT CLAY (CH), greenish gray and white, hard - PARTIALLY WEATHERED CHALK	SS		17-24-50/5"	4.5						
	10			SS		23-19-50/4"	4						
190													
			Auger refusal was encountered at 13.0 feet.										
	15												
185													
	20												
180													
	25												
175													
	30												
170													
	35												

BORING NUMBER B-11

CLIENT J.F. Ingram State Technical College
PROJECT NAME ISTC Building Perry Co. Detention Facility
PROJECT NUMBER GMGM220046
PROJECT LOCATION Uniontown, Alabama
DATE STARTED 10/17/22 **COMPLETED** 10/17/22
GROUND ELEVATION 202 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Mobile B47 Trailer, Manual-Hammer, HSA with SPT
AT TIME OF DRILLING not encountered
LOGGED BY M. Lloyd **CHECKED BY** K. Wales
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM) - 2"										
200			FAT CLAY (CH), light brown and light gray, medium	SS		2-3-3 (6)	2						
				SS		3-3-3 (6)	2						
	5		FAT CLAY (CH), light brown and light gray, very stiff	SS		5-7-9 (16)	3.5						
195			FAT CLAY (CH), white and pale yellow, slightly sandy, hard - weathered CHALK	SS		14-22-50/3"	4.5						
	10												
190													
	15		Auger refusal was encountered at 14.0 feet.										
185													
	20												
180													
	25												
175													
	30												
170													
	35												

1.GMC BORINGS GMGM220046 ISTC BUILDING AT PERRY CO. DETENTION.GPJ GMC DATA TEMPLATE.GDT 11/9/22

SUMMARY OF LABORATORY RESULTS

CLIENT J.F. Ingram State Technical College **PROJECT NAME** ISTC Building Perry Co. Detention Facility

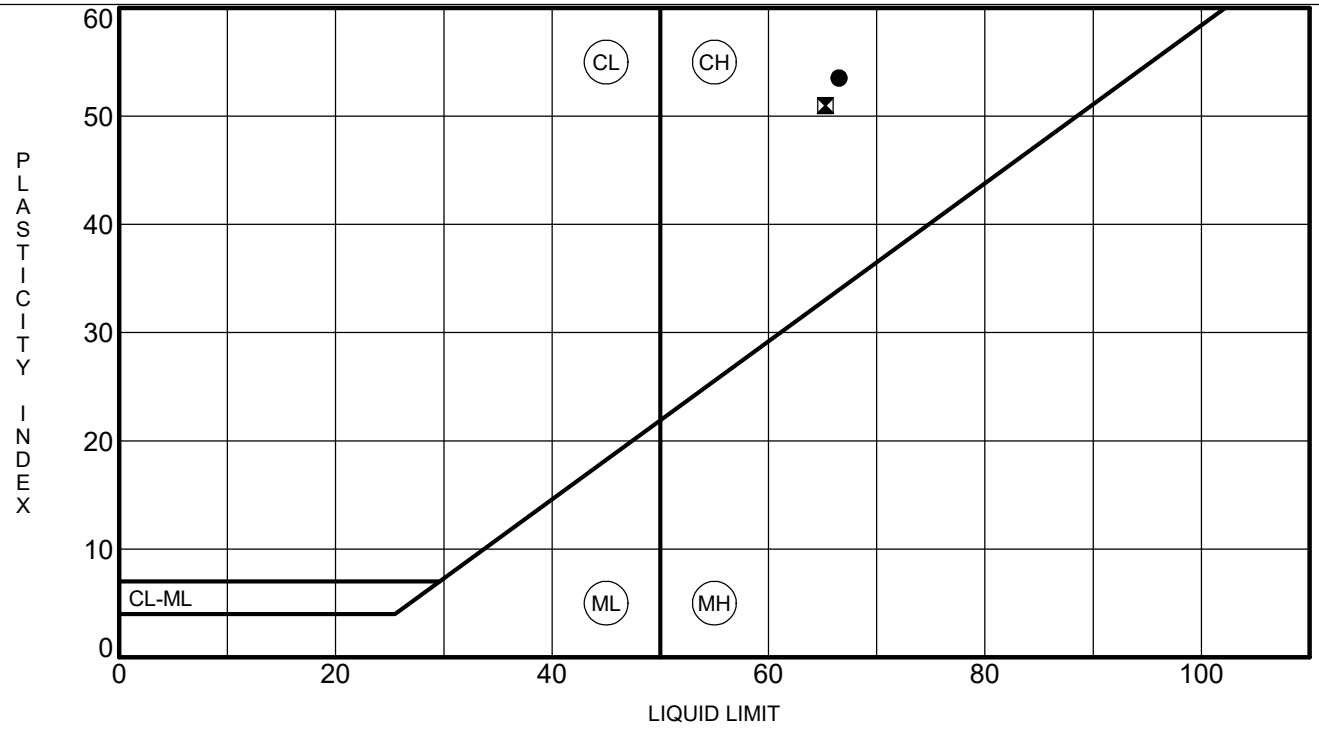
PROJECT NUMBER GMGM220046 **PROJECT LOCATION** Uniontown, Alabama

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Max. Sieve Size Tested (mm)	%<#200 Sieve	Natural Moisture (%)	Class-ification	Opt. Moisture Content (%)	Max Dry Density (pcf)	Specific Gravity
B-06	0-1.5						26.5				
B-06	1.5-3	67	13	54	0.075	94	23.8	CH			
B-06	4-5.5	65	14	51	0.075	96	31.0	CH			
B-06	9-10.5						19.7				

ATTERBERG LIMITS' RESULTS

CLIENT J.F. Ingram State Technical College **PROJECT NAME** ISTC Building Perry Co. Detention Facility

PROJECT NUMBER GMGM220046 **PROJECT LOCATION** Uniontown, Alabama

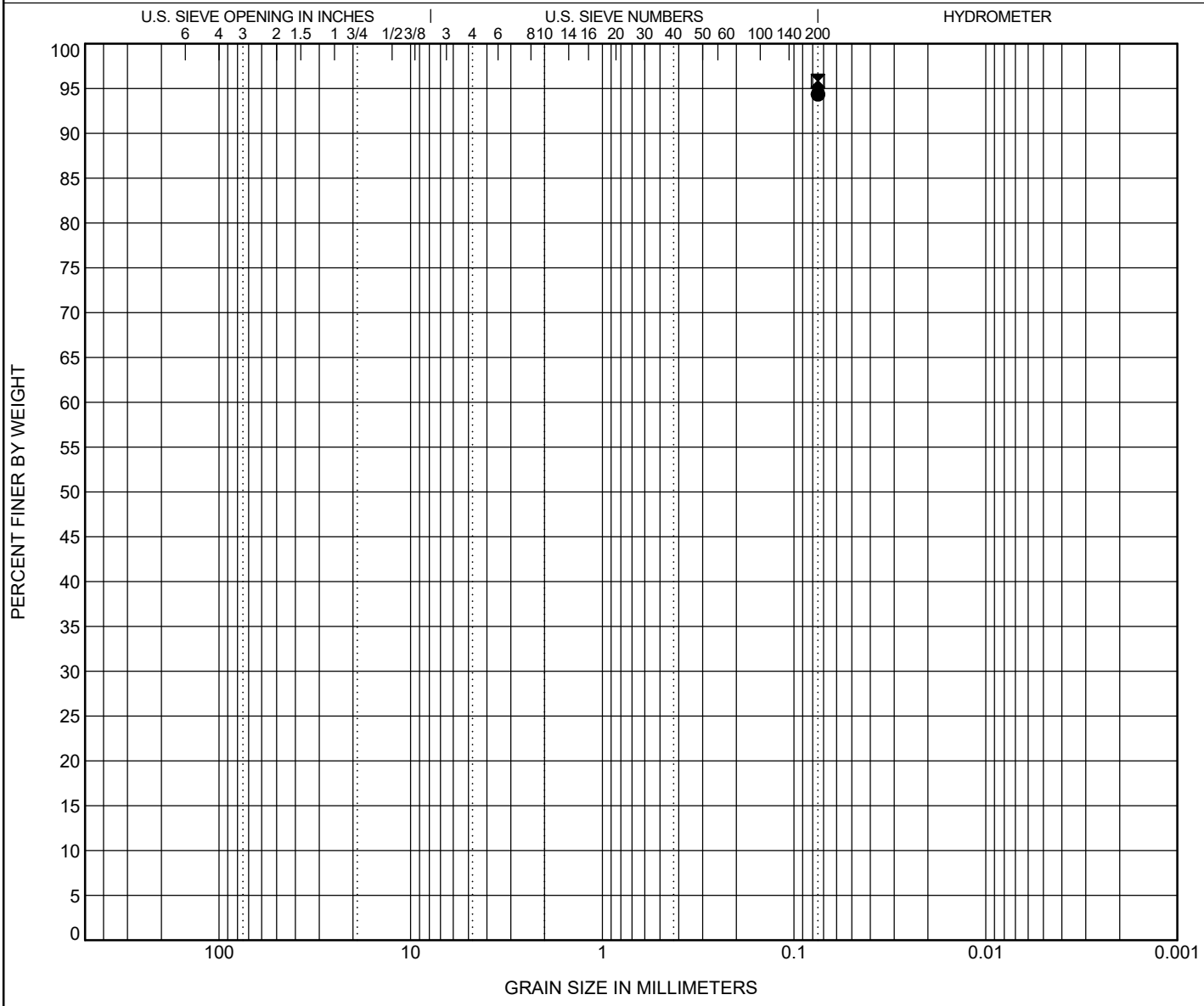


	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-06**	**1.5-3.0**	**67**	**13**	**54**	**94**	**FAT CLAY(CH)**
⊠	**B-06**	**4.0-5.5**	**65**	**14**	**51**	**96**	**FAT CLAY(CH)**

GRAIN SIZE DISTRIBUTION

CLIENT J.F. Ingram State Technical College **PROJECT NAME** ISTC Building Perry Co. Detention Facility

PROJECT NUMBER GMGM220046 **PROJECT LOCATION** Uniontown, Alabama



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-06**	**1.5-3.0**	**FAT CLAY(CH)**	**67**	**13**	**54**		
⊠	**B-06**	**4.0-5.5**	**FAT CLAY(CH)**	**65**	**14**	**51**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-06**	**1.5-3.0**	**0.075**						**94.3**	
⊠	**B-06**	**4.0-5.5**	**0.075**						**95.8**	

GMC

FIELD TEST PROCEDURES

General

The general field procedures employed by Goodwyn Mills Cawood, LLC (GMC), are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as borings.

The detailed collection methods used during this exploration are presented in the following paragraphs.

Standard Drilling Techniques

General: To obtain subsurface samples, borings are drilled using one of several alternate techniques depending upon the subsurface conditions. These techniques are as follows:

In Soils:

a) Continuous hollow stem augers.
b) Rotary borings using roller cone bits or drag bits, and water or drilling mud to flush the hole.
c) "Hand" augers.

In Rock:

a) Core drilling with diamond-faced, double or triple tube core barrels.
b) Core boring with roller cone bits.

Hollow Stem Auger: A hollow stem augers consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Rotary Borings: Rotary drilling involves the use of roller cone or drag type drill bits attached to the end of drill rods. A flushing medium, normally water or bentonite slurry, is pumped through the rods to clear the cuttings from the bit face and flush them to the surface. Casing is sometimes set behind the advancing bit to prevent the hole from collapsing and to restrict the penetration of the drilling fluid into the surrounding soils. Cuttings returned to the surface by the drilling fluid are typically collected in a settling tank, to allow the fluid to be recirculated.

Hand Auger Boring: Hand auger borings are advanced by manually twisting a 4" diameter steel bucket auger into the ground and withdrawing it when filled to observe the sample collected. Posthole diggers are sometimes used in lieu of augers to obtain shallow soil samples. Occasionally these hand auger borings are used for driving 3-inch diameter steel tubes to obtain intact soil samples.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemeted soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material that cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as "refusal material". Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D2113 using a diamond studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run,

the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

Sampling and Testing in Boreholes

General: Several techniques are used to obtain samples and data in soils; however, the most common methods in this area are:

a) Standard Penetrating Testing
b) Water Level Readings

These procedures are presented below. Any additional testing techniques employed during this exploration are contained in other sections of the Appendix.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2-inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Records. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water table readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water table at the time of our field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water table through short-term water level readings. Also, fluctuation in the water table should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Records are determined by field crews immediately after the drilling tools are removed, and several hours after the borings are completed, if possible. The time lag is intended to permit stabilization of the groundwater table, which may have been disrupted by the drilling operation.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone. The cave-in depth is measured and recorded on the Boring Records.

Boring Records

The subsurface conditions encountered during drilling are reported on a field boring record prepared by the Driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of ground water. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed, a geotechnical professional classifies the soil samples and prepares the final Boring Records, which are the basis for all evaluations and recommendations. The following terms are taken

from ASTM D2487 or Deere's Technical Description of Rock Cores for Engineering Purposes, Rock Mechanical Engineering Geology 1, pp. 18-22.

Relative Density of Cohesionless Soils From Standard Penetration Test	
Very Loose	‹ 4 bpf
Loose	5 - 10 bpf
Medium	11 – 30 bpf
Dense	31 - 50 bpf
Very Dense	› 50 bpf
(bpf = blows per foot, ASTM D 1586)	

Consistency of Cohesive Soils	
Very Soft	‹ 2 bpf
Soft	3 - 4 bpf
Medium	5 - 8 bpf
Stiff	9 - 15 bpf
Very Stiff	16 - 30 bpf
Hard	› 30 bpf

Relative Hardness of Rock
Very Soft Rock disintegrates or easily compresses to touch; can be hard to very hard soil.
Soft Rock may be broken with fingers.
Moderately Soft Rock may be scratched with a nail, corners and edges may be broken with fingers.
Moderately Hard Rock a light blow of hammer is required to break samples.
Hard Rock a hard blow of hammer is required to break sample.

Particle Size Identification	
Boulders	Larger than 12"
Cobbles	3" - 12"
Gravel	
Coarse	3/4" - 3"
Fine	4.76mm - 3/4"
Sand	
Coarse	2.0 - 4.76 mm
Medium	0.42 - 2.00 mm
Fine	0.42 - 0.074 mm
Fines (Silt or Clay)	Smaller than 0.074 mm

Rock Continuity	
RECOVERY = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}}$ x 100 %	
Description	Core Recovery %
Incompetent	Less than 40
Competent	40 - 70
Fairly Continuous	71 - 90
Continuous	91 - 100

Relative Quality of Rocks	
RQD = $\frac{\text{Total core, counting only pieces} \rangle 4\text{" long}}{\text{Length of Core Run}}$ x 100 %	
Description	RQD %
Very Poor	0 - 25 %
Poor	25 - 50 %
Fair	50 - 75 %
Good	75 - 90 %
Excellent	90 - 100 %

LABORATORY TESTING

GENERAL

The laboratory testing procedures employed by Goodwyn Mills Cawood, LLC (GMC) are in general accordance with ASTM standard methods and other applicable specifications.

Several test methods, described together with others in this Appendix, were used during the course of this exploration. The Laboratory Data Summary sheet indicates the specific tests performed.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Boring Records".

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary; grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

POCKET PENETROMETER TEST

A pocket penetrometer test is performed by pressing the tip of a small, spring-loaded penetrometer with even pressure to a prescribed depth into a soil sample. This test yields a value for unconfined compressive strength, which may be correlated with unconfined compressive strengths obtained by other laboratory methods.

MOISTURE CONTENT

Moisture contents are determined from representative portions of the specimen. The soil is dried to a constant weight in an oven at 100° C and the loss of moisture during the drying process is measured. From this data, the moisture content is computed.

ATTERBERG LIMITS

Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL) tests are performed to aid in the classification of soils and to determine the plasticity and volume change characteristics of the materials. The Liquid Limit is the minimum moisture content at which a soil will flow as a heavy viscous fluid. The Plastic Limit is the minimum moisture content at which the soil behaves as a plastic material. The Shrinkage Limit is the moisture content below which no further volume change will take place with continued drying. The Plasticity Index (PI) is the numeric difference of Liquid Limit and Plastic Limit and indicates the range of moisture content over which a soil remains plastic. These tests are performed in accordance with ASTM D4318, D4943 and D427.

PARTICLE SIZE DISTRIBUTION

The distribution of soils coarser than the No. 200 (75-mm) sieve is determined by passing a representative specimen through a standard set of nested sieves. The weight of material retained on each sieve is determined and the percentage retained (or passing) is calculated.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02110

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes Sections:

1. Section 02010 - "Subsurface Investigation"
2. Section 02200 - "Earthwork"

1.2 SUMMARY:

A. This Section includes the following:

1. Coordination of the Work, including in part, with the project Geotechnical Consultant, and the work of all trades.

2. Protection of existing trees and landscaping to remain, if any, and boundary and property line markers, bench marks, survey control points, and existing improvements which are to remain.

3. Environmental and erosion control measures, as indicated and as otherwise required by applicable codes, regulations, and authorities having jurisdiction.

4. Removal of trees and other vegetation, as indicated, and within "controlled areas."

5. Topsoil stripping, and stockpiling, as indicated, and within "controlled areas."

6. Removing above-grade improvements as indicated, and as required to accommodate new construction.

7. Removing below-grade improvements as indicated, and as required to accommodate new construction.

B. **Note** that a Site Preparation Package was previously awarded and completed prior to the Work of this contract. Each bidder shall visit the site to determine the extent of work completed under that contract and thereby the extent of work remaining to be completed for completion of this contract.

1. Bid and Contract Documents for the previous project will be available for review at the offices of the Architect.

2. This Section 02110 is generally the same specification Section from the previous project.

1.3 PROJECT CONDITIONS:

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements:

1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place. Clearing, demolition and excavation within 5'-0" of any existing buildings and structures to remain shall be performed by hand.

2. Protect improvements on adjoining properties and on Owner's property.

3. Protect boundary and property line markers, benchmarks, and survey control points.

4. Restore damaged improvements and markers to their original condition, as acceptable to property owners.

C. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fencing, barricades, and/or other precautions as necessary to protect trees and vegetation to be left standing.

2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.

3. Provide protection for roots over 1-1/2-inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

4. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Architect. Employ a licensed arborist to repair damages to trees and shrubs.

5. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.

D. Improvements on Adjoining Property:

1. Authority for performing any removal and alteration work on property adjoining Owner's property will be obtained by Owner prior to award of contract, if any is indicated or required.

2. Extent of work on adjacent property is indicated on Drawings, if any.

E. Salvable Improvements: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

PART 2 - PRODUCTS

A. Not applicable to this Section.

PART 3 - EXECUTION

3.1 SITE CLEARING:

A. General:

1. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes digging out and off-site disposal of stumps and roots.

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.

B. Topsoil:

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches, and up to 18 inches deep at this site. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

   a. Remove heavy growths of grass from areas before stripping.

   b. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

3. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, as required, to prevent wind erosion.

   a. It is expected that **at least 2,000 cubic yards (CY) of topsoil** will be removed and stockpiled for redistribution by the Contractor and Landscape Subcontractor during and after the planned follow-on new building construction.

4. Dispose of unsuitable or excess topsoil unwanted by the Owner, the same as specified for disposal of waste material.

5. Fill depressions caused by site clearing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground, unless specific compaction is otherwise indicated in Section 02200.

C. Removal of Improvements:

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

2. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of related Division 15 and 16 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section.

3.2 DISPOSAL OF WASTE MATERIALS:

A. Burning on Owner's Property: Burning is not permitted on Owner's property, unless the Contractor applies for and receives proper permit from local and state authorities having jurisdiction.

B. Removal from Owner's Property: Remove unacceptable soils materials beyond new work areas as acceptable to the Owner. Remove organic materials, waste materials, trash, and debris, and legally dispose of off Owner's property.

1. Stockpile acceptable clean topsoil and excess soil materials without any construction debris, trash, tree roots over 1-inch in diameter, stumps, etc., at on site location(s) as directed by the Owner and Architect.

END OF SITE CLEARING

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 01720 - "Project Record Documents"
2. Section 02010 - "Subsurface Investigation"
3. Section 02110 - "Site Clearing"
4. Section 02668 - "Water Service Piping"
5. Section 02720 - "Storm Drainage"
6. Section 02900 - "Landscape Work"
7. Section 03310 - "Concrete"

C. Refer to Division 1 Sections "Allowances" and "Unit Prices" for additional information and requirements.

1.2 SUMMARY:

A. This Section includes the following:

1. Preparing of subgrade for building slabs, walks, and pavements, and other features for building construction and site improvements.

a. Note that it is anticipated that work under Division 2 Section "Site Clearing" (verified under the Work of this contract) will result in removal of at least 2" to 6" of topsoil (stockpiled on-site for use with this follow-on building project), as further indicated on the Drawings and in the Owner's "Report of Geotechnical Exploration".

1) The work of this Section shall also include complete removal of any existing utilities and relocation where indicated; Refer to Drawings for additional information and requirements within the "controlled areas" and elsewhere on site.

2) Stripping of exposed grade shall extend at least 10-feet beyond the limits of construction cut and fill.

b. In "controlled areas", at least the top 6-inches of existing exposed subgrade remaining after stripping, and verified by proofrolling and testing as acceptable to remain, shall be scarified, moisture-conditioned, and processed in place, and compacted to 98% standard density, prior to adding any "structural fill" placed as "engineered fill" or performing any other excavation to establish subgrades required for new work.

c. Comply with Owner's "Report of Geotechnical Exploration"; Refer also to Civil and Structural Drawings for additional information and requirements.

d. "Building Controlled Areas" and other "Controlled Areas" include below building footprint, areas below roofs, canopies and covered porches, and 10-feet beyond, and below and 5-feet beyond walks, pads and paving.

e. "Building controlled area" and all other "controlled areas" shall have a minimum layer of tested, approved, and compacted, acceptable on-site "structural fill" building pad (compacted to minimum 98-percent standard density), at least to the minimum depth indicated below, and additional depth as required by actual excavation and/or fill depths and subgrade elevations indicated; (verified as under the Work of this contract):

1) At least 5-feet of completed depth of "structural fill" (from pre-approved acceptable off-site material) placed as "engineered fill" in building and other "controlled areas", over minimum of 6-inches conditioned and properly prepared subgrade as indicated (6-inches of "modified roadbed" at paving).

2) Refer to Owner's "Report of Geotechnical Exploration", Civil and any Structural Drawings for additional information, possible options, and requirements.

f. Perform excavation by hand within 5'-0" of any existing buildings and structures to remain. Design and provide all necessary supports, shoring, etc., as required to prevent settlement, collapse, and/or other damage to existing buildings and structures to remain.

1) DO NOT EXCAVATE BELOW THE EFFECTIVE BEARING AREA OF ANY EXISTING BUILDING FOUNDATIONS AND STRUCTURES TO REMAIN. In the event of conflict during construction, notify Architect prior to proceeding with work in the effected area.

g. Compaction of backfill at any basement and below grade walls shall only be by hand-directed compaction equipment. Heavy construction equipment and/or heavy trucks shall not be allowed within 10-feet of any basement walls, and within 5-feet of foundation walls.

2. Drainage fill course (porous fill) for support of any building slabs, compacted in place, is included as part of this work.

3. Excavating and backfilling of trenches within building lines and "controlled areas".

4. Stripping and stockpiling of topsoil is specified in Division 2 Section "Site Clearing."

5. The extent of earthwork is indicated on the Drawings.

6. Removal of existing improvements may also be further specified under various Division 2 Sections.

B. Excavating and Backfilling for Mechanical and Electrical Work (where applicable): Refer to Divisions 15 and 16 sections for excavation and backfill required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances, not work of this Section.

1. However, construction materials and execution for Mechanical and Electrical work shall comply with requirements of this Section 02200, and related Division 2 Sections, when the work and/or materials required are not indicated or only partially indicated in Divisions 15 and 16.

C. Placement and compaction of at least 4-inches of topsoil (stockpiled under the previous Site Preparation Package and any additional material salvaged for re-use under the Work of this contract) up to finish grades in areas to be seeded or grassed is included in the work of Division 2 Section "Landscape Work", not the work of this Section.

1. Coordination with the work of other subcontractors is required.

2. Allow for thickness of 4-inches of topsoil, and where sod is indicated allow for thickness of sod.

1.3 DEFINITIONS:

A. "Excavation" consists of removal of materials and existing improvements encountered to subgrade elevations indicated and subsequent disposal of materials removed.

B. "Unauthorized" excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

C. "Additional Excavation": When excavation has reached required subgrade elevations, notify Geotechnical Consultant, Civil Engineer and Architect, who will review conditions. If it is determined that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect.

1. The Contract Sum will be adjusted by Change Order, or as provided in General Conditions, for additional excavation and its replacement appropriately authorized in writing prior to beginning the work, and for which the Contractor is due payment from the Owner.

D. "Subgrade": The undisturbed earth or the compacted soil layer immediately below pavement base course, drainage fill, or topsoil materials.

E. "Structure": Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

F. "Building Control Area" and/or "Controlled Area": Below and 5-feet beyond building footprint or exterior walls, and below roofs, to include covered porches and canopies, and below and 5-feet beyond all walks and pavements.

G. "Mud Footings" (or "mud mats", or "mud sills"; if any): The 2-inches to 4-inches of lean 2,500 psi (minimum) concrete placed in the bottom of footing and foundation trenches and excavations, which is required if permanent or structural concrete cannot be placed the same day they are excavated.

1. Unless mud footings are indicated on Structural Drawings, their depth shall be compensated for by over-excavation.

2. Mud footings (if any) shall be completely clean prior to placement of any reinforcing and/or permanent or structural concrete.

3. Refer to the Owner's "Report of Geotechnical Exploration", and Structural Drawings for additional information and requirements for other "mud footings" (or "mud mats", or "mud seals").

H. Rock (or similar existing concrete; if any): Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.

2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157-kW) flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

1.4 SUBMITTALS:

A. Test results shall be reported in writing to Architect, Structural Engineer, Civil Engineer, Lessee/User, Program Manager and Contractor on same day tests are made.

1. Test reports on fill and borrow material; On-site as well as off-site materials.

2. Verification of suitability of each foundation, floor slab and subgrade condition and material, in accordance with specified requirements.

3. Field reports; and in-place soil density tests.

1.5 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work on site and in right-of-ways in compliance with applicable requirements of authorities having jurisdiction.

B. Testing and Inspection Service: All required soil testing and inspection services during earthwork operations shall be performed by a qualified independent geotechnical testing laboratory.

1. Refer to Division 1 Section "Special Conditions", for additional information and requirements.

1.6 PROJECT CONDITIONS:

A. Site Information: Refer to Division 2 Section "Site Clearing", and Civil Drawings, for additional information and recommendations.

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations in the vicinity, and as may also be required for other construction work.

1. Notify the Alabama Line Location Center at 1-800-292-8525 at least 2-full working days (48 hours), excluding weekends and holidays, prior to any excavation work. This organization will contact its member utility companies to locate and mark all of their own underground facilities.

a. Notify non-member companies directly, for them to perform this service.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions and record locations on as-built record drawings. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

a. Provide minimum of 48-hour notice to Owner and copy Architect, and receive written notice to proceed before interrupting any utility.

4. Demolish and completely remove from the site any existing underground utilities indicated to be removed, and all existing underground utilities in "controlled areas". Coordinate with utility companies for shutoff of services if lines are active.

C. Use of Explosives: Use of explosives *is not* permitted.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Comply with requirements of current regulations of OSHA, applicable Codes, ordinances, and authorities having jurisdiction.

4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

5. Perform excavation by hand within 5'-0" of any existing buildings and structures to remain, and within dripline of large trees to remain. Protect root systems from damage or dry-out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap. Paint root cuts of 1-1/2-inches and larger with emulsified asphalt tree paint.

   a. Do not under-mine or excavate below footings and/or foundations which are to remain.

6. CAUTION: Vibratory compaction equipment should not be used within 10-feet of any existing buildings.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS - DEFINITIONS:

A. Satisfactory soil materials are defined as clean, non-saturated, non-organic sections of earth taken from on-site cuts (if allowed), and complying with ASTM D2487 soil classification groups included in recommendations of the Owner's "Report of Geotechnical Exploration", or if not included, as directed at the time of earthwork operations and/or acceptance resulting from acceptable test results obtained on soil materials proposed by the Contractor and tested by the project Geotechnical Engineer, as required by the Bid and Contract Documents.

   1. Note: On-site soils shall be used as structural fill in building and any controlled areas after tested and found acceptable to the Project Geotechnical Engineer.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups other than those indicated above.

C. Drainage Fill (or "porous fill" or "drainage aggregate"): Clean, washed, evenly graded mixture of free-draining pea gravel, coarse sand, or crushed stone, subject to approval by the project geotechnical engineer and testing laboratory, and as follows:

***"DRAINAGE / POROUS FILL"*:**

Passing No. 50 Sieve:	50% maximum
Passing No. 200 Sieve:	5% maximum

Compaction: 98% S.P.D.
Minimum Completed Thickness: 4-inches.

D. Backfill and Fill Materials (Grassed areas only; Cuts and fills outside "controlled areas", during general grading): Satisfactory soil materials from on-site excavations, free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

1. All fill soils must be compatible with existing soils, so they can bond together.

E. Offsite Borrow Material - Only if Required ("Select Fill" and/or "Structural Fill"): Clean, non-saturated, non-organic, non-expansive clayey soils, Clayey Sand (SC or SC-SM), or Sandy Clay (CL) acceptable to Project Geotechnical Engineer, from an off-site borrow source, free of rocks larger than 3-inches, debris, organics, vegetation, and other deleterious matter, and at least as follows:

***"STRUCTURAL FILL" - OFF-SITE BORROW*:**
(IF ANY)

Passing 3" Sieve:	100%
Passing No. 4 Sieve:	75% minimum
Passing No. 200 Sieve:	35% to 70%
Liquid Limit (LL):	40% maximum
Plasticity Index (PI):	6 to 16 maximum
Dry Unit Weight (ASTM D-698):	105 pcf minimum

Compaction: 98% S.P.D.

1. All fill soils must be compatible with existing soils, so they can bond together.

F. Topsoil: Refer to Division 2 Section "Site Clearing."

PART 3 - EXECUTION

3.1 PROOFROLLING:

A. Areas throughout significant slopes and beneath and 10'-0" beyond new building and covered areas, and beneath and 5'-0" beyond any new walk and pavement areas (back-of-curb or other paving edge termination) shall be designated as "controlled areas." Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a partially loaded truck with a rear single axle weight of 8 to 10 tons, or similarly weighted construction equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the "controlled areas". Soft, organic, or excessively wet soils found during the proofrolling operations shall be excavated and replaced with suitable compacted fill. The exposed subgrade must be well drained to prevent the accumulation of water.

1. Proofrolling shall be conducted in the presence of testing lab's Geotechnical Engineer.

2. Do not proofroll when the ground surface is wet or saturated with water.

3.2 EXCAVATION:

A. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as structures, foundations, rock or unauthorized excavation.

B. Perform excavation by hand within 5'-0" of any existing buildings and structures to remain.

1. Do not under-mine or excavate below footings and/or foundations which are to remain.

C. Refer to "Definitions" paragraph above and Structural Drawings for any "mud footings" required.

3.3 STABILITY OF EXCAVATIONS:

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time excavations will be open. Extend shoring and bracing as excavation progresses.

3.4 DEWATERING:

A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3.5 STORAGE OF EXCAVATED MATERIALS:

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Install erosion control measures as necessary to prevent siltation onto adjacent properties or onto the project area.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Dispose of clean excess excavated soil material by spreading at on-site location as directed by Owner;

3. Dispose of unsuitable materials and materials not wanted by the Owner and which are not acceptable for use as backfill by spreading beyond the limits of the Work of this contract, as directed by the Architect and Owner;

4. Dispose of trees, stumps, trash and debris by removal and legal disposal off site.

3.6 EXCAVATION FOR STRUCTURES:

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS:

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.8 TRENCH EXCAVATION FOR PIPES AND CONDUIT:

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6-inches to 9-inches of clearance on both sides of pipe or conduit.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on minimum of 4-inches of compacted “select fill” bedding. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

1. Backfill trenches with “select fill”, compacted in place.

C. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage, etc.) so top of piping is not less than 2’-6” below finished grade and/or paving.

D. Unless specifically indicated otherwise, where rock or concrete is encountered, carry excavation 6” below required elevation and backfill with a 6” layer of crushed stone or gravel, prior to installation of pipe.

3.9 COLD WEATHER PROTECTION:

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.10 BACKFILL AND FILL:

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under all areas, use satisfactory excavated material, or only where required and directed utilize approved off-site borrow material. Refer to Owner’s “Report of Geotechnical Exploration”, and this Section 02200 for minimum testing requirements.

2. Under building slabs, use drainage fill material of compacted and finished depth indicated, or if not indicated, at least 4-inches compacted and completed thickness. (Not included in this sitework contract)

3. Backfill trenches with concrete where trench excavations pass within 18-inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

   a. Concrete is specified in Division 3.

   b. Do not backfill trenches until inspections and any required testing have been made and backfilling is authorized by Architect based on test results. Use care in backfilling to avoid damage or displacement of pipe systems.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, etc.

2. Inspections, testing, approval, and recording locations of underground utilities have been performed and recorded.

3. Removal of concrete formwork, if any.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.

   a. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

5. Removal of trash and debris from excavation.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls, where necessary.

3.11 PLACEMENT AND COMPACTION:

A. Ground Surface Preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1-vertical to 4-horizontal so that fill material will bond with existing surface.

2. When existing ground surface has a density less than that specified under “Compaction” for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

3. Refer to Division 1 Section “Unit Prices” for possible additional requirements.

B. 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.

1. CAUTION: Vibratory compaction equipment should not be used within 5-feet of any existing buildings or structures to remain, or within 10-feet of basement and other below grade walls.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 698 A:

a. Under structures, building slabs and steps, sidewalks, pads, and in all "controlled areas", and 10-feet beyond, compact at least the top 6-inches of subgrade and each layer of backfill or fill material at 98-percent maximum density. Compact the top 6-inches of the exposed subgrade in both cut and fill areas to at least 98-percent maximum density.

1) Refer to Paragraph 1.2 above and Owner's "Report of Geotechnical Exploration", for areas where additional depth(s) of preparation and compaction of exposed subgrades are or may be required.

b. Under pavements and 5-feet beyond (measured from back-of-curb or edge of paving, where occurs), process and compact top of subgrade and each layer of backfill or fill material at 98-percent maximum density; Refer to Civil and Structural Drawings for additional information and requirements.

1) Modified roadbed and other base material indicated below vehicular asphalt and concrete pavements: 100-percent S.P.D. Refer to Drawings for additional information and requirements.

2) Crushed stone or other base material indicated below vehicular asphalt and concrete pavements: 100-percent S.P.D. Refer to Drawings for additional information and requirements.

c. Under lawn or unpaved areas beyond "controlled areas", compact each layer of backfill or fill material at 85-percent maximum density.

d. On-site Borrow (where allowed): 98-percent standard density.

e. Structural Fill (or "Select Fill"): 98-percent standard density.

f. Porous Fill (drainage course): 98-percent standard density.

2. Modified Roadbed: Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 230.03.

a. Compaction: 98% S.P.D.

3. Crushed Aggregate Base: Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 825 and Article 301.

a. Compaction: 100% S.P.D.

4. Soil Aggregate Base: Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 823 and Article 301.

a. Compaction: 100% S.P.D.

5. Moisture Control:

a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

b. Remove and replace, or scarify and moisture condition, soil material that is too wet to permit compaction to specified density.

c. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist moisture conditioning by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

d. At the time of placement and densification, the moisture content of "engineered fill", "structural fill", "select fill", and "retaining wall backfill" shall be within 3% of the materials' ASTM D-698 optimum moisture content for native clay, "select fill", "structural fill", and "retaining wall backfill".

e. Structural fill areas exposed to excessive wetting, drying or otherwise disturbed by the construction following acceptance for moisture and density should be retested followed by the correction of deficient areas just prior to the installation of additional fill or structures.

f. In no instance should placement of structural fill or ground supported structures be permitted if the ground surface soils contain a moisture content in excess of 3% of the materials optimum moisture content.

g. In no case shall porous drainage backfill (except as specifically indicated at foundation drains only) or masonry sand material be used adjacent to foundations or utility trenches. Care shall be taken to prevent masonry brick/block debris from falling or being pushed into foundation and/or trench excavations.

3.12 GRADING:

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10-foot above-or-below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10-foot above-or-below required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation.

4. Connection of Existing and New Work: Provide flush transition, unless specifically indicated otherwise.

C. Grading Surface of Fill under Building Slabs and "Building Control Areas": Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.13 BUILDING SLAB DRAINAGE COURSE (Not included in previous sitework contract; Part of this Contract):

A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs, sidewalks, pads, and below canopies and covered porches, and elsewhere as indicated.

1. Minimum Completed Thickness: 4-inches.

B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. When a compacted drainage course is indicated to be 6-inches thick or less, place material in a single layer. When indicated to be more than 6-inches thick, place

material in equal layers, except no single layer more than 6-inches or less than 3-inches in thickness when compacted.

3.14 FIELD QUALITY CONTROL:

A. Quality Control Testing During Construction:

1. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

2. Perform field density tests in accordance with ASTM D 698 (sand cone method), or acceptable nuclear testing method, as applicable.

3. New Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test per concrete pour (minimum) and one test per 50-feet of footing length, to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Architect.

4. New Paved Areas, New Building Slab and "Building Control Areas" Subgrade: Perform at least one field density test of subgrade for every 3,000-square feet of fill area (4,000-square feet in pavement areas) for each foot of vertical thickness of fill placed in "controlled areas", with a minimum of four (4) tests per lift.

5. Foundation Wall Backfill: Perform at least 1-field density test for every 50-linear feet, at locations and elevations as directed, with a minimum of 2-field density tests for each retaining wall.

6. Trenches: Perform at least one field density test for every 50-linear feet for each 24-inches of vertical thickness of fill placed in utility or similar trenches, which extend through the "controlled areas".

   a. Retaining walls, if any, same as for "Trenches", as indicated above.

7. A laboratory soil particle size, Atterberg limit, and Proctor density test shall be performed on each different type of fill soil used in the "controlled areas".

8. If in opinion of Architect - based on Project Geotechnical Engineer's testing reports, inspection, and recommendations - subgrade or fills that have been placed are below specified density, perform additional earthwork, compaction, and/or other operations, and re-testing, until specified density is obtained.

3.15 EROSION CONTROL:

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

B. Refer to Division 1 Section "Unit Prices" for possible additional requirements.

3.16 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Repair edges of existing pavements, sidewalks, etc., and other existing and/or new improvements flush with and to match existing materials and thicknesses, subject to acceptance by Owner and Architect.

D. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

E. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Burning on Owner's Property: Burning is not permitted on Owner's property, unless the Contractor applies for and receives proper permit from local and state authorities having jurisdiction.

B. Removal from Owner's Property: Remove unacceptable soils materials beyond new work areas and spread, as acceptable to the Owner. Remove organic materials, waste materials, trash, and debris, and legally dispose of off Owner's property.

1. Stockpile acceptable clean topsoil and excess soil materials without any construction debris, trash, tree roots over 1-inch in diameter, stumps, etc., at on site location(s) as directed by the Owner and Architect, for re-use in landscaping and grassing work.

2. Spread any acceptable excess soil materials at on site location(s) as directed by the Owner and Architect, or if unwanted by Owner, transport and legally dispose of off Owner's property.

END OF EARTHWORK

SECTION 02250

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY:

A. This Section covers the installation and maintenance of erosion control measures for the project.

B. All necessary precautions to prevent erosion and siltation, as required by the Alabama Department of Environment Management (ADEM). Storm Water Best Management Practices shall be followed, including items specified herein.

C. The Contractor shall maintain all erosion control measures installed on a regular basis. The Contractor shall repair or replace damaged measures at the direction of the Engineer at no additional cost to the Owner.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 02291 – Seeding and Restoration

C. Sedimentation and erosion control measures shall conform to the requirements of the most current:

1. Alabama NPDES Construction General Permit
2. ADEM Storm Water Management BMP
3. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT).
4. *Alabama Handbook for Erosion Control, Sediment Control, and Storm Water Management on Construction Sites and Urban Areas*

D. An approved project BMP Plan hereby incorporated by reference has been developed for this project. The Contractor will receive a copy of the BMP Plan at the mandatory pre-construction meeting. The Contractor shall become the day to day operator of the BMP Plan and assume responsibility for the requirements of the BMP Plan including inspections and record keeping.

1.3 SUBMITTALS:

A. The Contractor shall keep on-site an updated copy of the BMP Plan in accordance with NDPES permit requirements.

1.4 QUALITY ASSURANCE:

A. All NPDES permit required inspections shall be performed by the Owner's QCI certified inspector (Inspector).

B. Any cost incurred by the Contractor for inspection due to delays in construction or overrun of the contract time shall be paid for by the Contractor and shall not be the responsibility of the Owner or Engineer.

C. Contractor shall be responsible for compliance with the stormwater permit, including the BMP Plan. Any fines incurred by the Owner stemming from the stormwater permit shall be paid by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Furnish Stone and Aggregate materials per current ALDOT standards.

B. Stone for Check Dam: Stone conforming to Division 800 of the current ALDOT Standard Specifications. Size range from 2-inches to 10-inches equally distributed.

C. Stone for Rip Rap: Class 2 rip rap conforming to Section 814 of the current ALDOT Standard Specifications. Sizes ranging from 10 pounds to 200 pounds equally distributed.

D. Aggregate for Construction Entrance: Coarse aggregate, with size range of 1.5-inches to 3.5-inches, conforming to Division 800 of the current ALDOT Standard Specifications.

E. All rolled erosion control products (RECPs) including Temporary Erosion Control Blankets (ECB), and Turf Reinforcement Mat (TRM) shall meet the requirements of Section 860 of the current ALDOT Standard Specifications.

1. Excelsior matting (ECB) shall be installed on all seeded drainage swales, ditches, slopes of 3:1 or steeper, or as directed by the Engineer.

    a. Provide Curlex® III Long-Term Erosion Control Blanket as manufactured by American Excelsior Company or approved equivalent. The ECB shall provide seed and topsoil protection for up to 36 months.

F. Non-Woven Geotextile Fabric underlaying construction entrances and rock ditch checks shall meet the requirements of the current ALDOT Standard Specifications.

2.2 SILT FENCE:

A. The height of a silt fence shall not exceed 36-inches (0.9 m). Storage height and ponding height shall never exceed 18-inches (0.5 m).

B. The standard-strength filter fabric shall be stapled or wired to the fence, and six (6) inches (0.2 m) of the fabric shall extend into the trench.

C. When standard-strength filter fabric is used, a 4”x4” 12-x12-gauge steel wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least 1-inch (25.4 mm) long, tie wires or hog rings. The wire shall extend into the trench a minimum of 2-inches (51 mm) and shall not extend more than 36-inches (0.9 m) above the original ground surface.

D. When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts.

2.3 INLET FILTER:

A. A filter shall be used at any stormwater inlet during construction to filter runoff where soils have been disturbed.

B. The filter shall be a weighted sediment tube filter with a diameter of 9.5-inches at the ends and tapering to 5 inches in the center. Lengths shall be 6 to 9 feet with a build-in triangular overflow for relief during high-intensity storm events.

C. Unit Weight: 13 lbs/ft

D. Interior Filter

1. Materials: Shredded, recycled tire rubber particles with less than 2% metal and the rubber shall be washed during manufacturing.
2. Particle Size: ½ inch to ¾ inch particle size

E. The geotextile bag shall have

1. Percent Open Area: 8%
2. Apparent Opening Size: 30 U.S. Sieve
3. Grab Tensile Strength: 400 lbs
4. Flow Rate: 115 gal/min/ft^2
5. Puncture Strength: 125 lbs

2.4 TURBIDITY CURTAINS:

A. Turbidity Curtains shall be placed at locations shown on the Drawings or as deemed necessary by the Engineer.

B. Curtains shall be Type I DOT with 6” or 8” square foam filled floats. The fabric shall be 18 oz. PVC, as manufactured by GEI Works or approved equivalent.

2.5 SEDIMENT TUBES:

A. Sediment tubes shall conform to the requirements of the current ALDOT specifications.

1. Sediment tubes shall be composed of compacted geotextile, curled excelsior wood fiber, natural coconut fiber, hardwood mulch, growing media or a mixture of these materials enclosed by a flexible netting material and utilize an outer netting that consists of seamless high-density polyethylene, photodegradable material treated with ultraviolet stabilizers or a seamless, high-density polyethylene, non-degradable material.
2. Straw, straw fiber, straw bales, pine needles and/or leaf mulch shall not be used.
3. Curled excelsior wood fiber or natural coconut fiber RECPs rolled up to create a sediment tube device shall not be used.
4. Anchor posts shall be steel posts minimum of 48” long
5. Sediment tube diameter shall be between 18” and 24”. The mass per unit length shall be 3-lb/ft for 18” tubes and 4-lb/ft for 24” tubes with a 10% margin of error.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install all Erosion and Sediment Control BMPs in accordance with BMP Handbook, the project BMP Plan, and local requirements.

B. Check Dam

1. Determine length required for ditch or depression slope and excavate, backfill, and compact foundation area to firm, even surface.
2. Install filter fabric prior to rock installation.
3. Place Class B erosion control stone in an even distribution of rock pieces with minimum voids to the indicated shape, height, and slope.

C. Temporary Construction Entrances

1. Install construction entrances per the details shown on Drawings. Minimum thickness is six (6) inches.
2. Mound aggregate near intersection with public road to prevent site runoff entering road.
3. Periodically dress entrances with 2-inch thick course aggregate when aggregate becomes clogged with soil.

D. Silt and Turbidity Curtain

1. Install per manufacturer's recommendations.

E. Erosion Control Blanket

1. Install per manufacturer's recommendations.

F. Turf Reinforcement Mat

1. Install per manufacturer's recommendations.

G. Silt Fence

1. The fence line shall follow the contour as closely as possible.
2. If possible, the filter fabric shall be cut from a continuous roll to avoid the use of joints. When joints are necessary, filter cloth shall be spliced only at a support post, with a minimum 6-inch (0.2 m) overlap and both ends securely fastened to the post.
3. Posts shall be spaced a maximum of 10-feet (3.1 m) apart and driven securely into the ground (minimum of 12-inches (0.3 m)). When extra-strength fabric is used without the wire support fence, post spacing shall not exceed 6-feet (1.8 m).
4. Turn the ends of the fence uphill.
5. A trench shall be excavated approximately 4-inches (101 mm) wide and 6-inches (0.2 m) deep along the line of posts and upslope from the barrier.
6. The trench shall be backfilled and the soil compacted over the toe of the filter fabric.
7. Silt fences placed at the toe of a slope shall be set at least 6-feet (1.8 m) from the toe in order to increase ponding volume.
8. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized and any sediment stored behind the silt fence has been removed.

9. Silt fences and filter barriers shall be inspected weekly after each significant storm (1-inch (25.4 mm) in 24 hour). Any required repairs shall be made immediately.
10. Sediment should be removed when it reaches 1/3 height of the fence or 9-inches (0.3 m) maximum.
11. The removed sediment shall conform to the existing grade and be vegetated or otherwise stabilized.

3.2 CLEANING:

A. When sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one-half channel depth.

3.3 INSPECTION AND MAINTENANCE:

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

B. It is the Contractor's responsibility to perform all required inspections in accordance with all Authorities having Jurisdiction.

C. Contractor is responsible for continually maintaining all temporary erosion control measures until permanent measures are properly installed and performing as required.

3.4 TEMPORARY PERMANENT SEEDING:

A. Apply temporary or permanent seeding to restrain erosion on all disturbed areas as soon as practical but in no case longer than 14-calendar days following temporary or permanent cessation of construction whether or not the area is being used for construction access.

3.5 REMOVAL AND FINAL CLEANUP:

A. Soil and erosion measures are to be maintained and remain in place until the disturbed area is stabilized and inspected by the Owner.

B. Once the Notice of Termination has been submitted by the Engineer, the Contractor shall remove and dispose offsite all erosion and sediment control device and other remaining items. Dispose of all silt and waste materials offsite in a proper manner. Complete final restoration activities.

END OF SECTION 02250

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02282

TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 02200 - "Earthwork"
2. Section 03310 - "Concrete"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes soil treatment for termite control, for use and application below any new on grade interior floor slabs, and also where any existing slabs may be opened or removed for any new, repair, replacement, or other subgrade work at interior of building and/or within interior perimeter exterior walls.

1.3 SUBMITTALS:

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

1. Include the EPA-Registered Label for termiticide products.

B. Qualification Data: For Installer of termite control products.

C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

B. Submit completed forms for required warranties, guarantees, and bonds for acceptance, prior to beginning work.

1.4 QUALITY ASSURANCE:

A. In addition to requirements of these specifications, comply with manufacturer's written instructions and recommendations for work, including preparation of substrate and application.

B. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

C. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

D. Source Limitations: Obtain termite control products through one source and from a single manufacturer for each product.

E. Obtain the Owner's specific written approval for the exact chemicals intended for use prior to any application, due to the close proximity of the community/public water supply.

F. Mix treatment solution on site, in presence of Contractor's Superintendent, using clean potable water and new termiticide delivered to site in undamaged, original, unopened, and factory-sealed containers.

1.5 JOB CONDITIONS:

A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

B. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.6 SPECIFIC PRODUCT AND PROJECT WARRANTY AND GUARANTEE:

A. Furnish written five (5) year warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Applicator will re-treat soil and repair or replace damage caused by termite infestation.

B. Provide paid-up and bonded guarantee for a period of five (5) years from date of treatment, signed by the Applicator and Contractor. Paid-up guarantee shall include annual inspection during the five (5) years and an agreement to renew the bond annually after the five (5) years is up, on payment by the Owner of an annual fee.

C. A specimen of the form of guarantee and the bond shall be submitted for approval before the work begins.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT SOLUTION:

A. Manufacturers: Subject to compliance with requirements, provide one of the following termiticide products:

1. Aventis Environmental Science USA LP; Termidor.
2. Bayer Corporation; Premise 75.
3. Dow AgroSciences LLC; Dursban TC or Equity.
4. FMC Corporation, Agricultural Products Group; Talstar, Prevail FT, or Torpedo.
5. Syngenta; Demon TC.

2.2 SOIL TREATMENT:

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 - EXECUTION:

3.1 EXAMINATION:

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL:

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT:

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.

2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.

3. Crawlspaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.

4. Masonry: Treat voids.

5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF TERMITE CONTROL

SECTION 02511

HOT-MIXED ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work described elsewhere includes:

1. Section 02010 - "Subsurface Investigation"
2. Section 02200 - "Earthwork"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes new bituminous paving, base, any indicated pavement repairs/resurfacing, and otherwise as indicated on Drawings; In the event of conflict between this Section and Drawings, the more stringent requirements shall be provided.

B. Work shall also include pavement patching for any utility trenches under existing paving and this Contract, with prepared subgrade, 8-inches of base material indicated, 6-inches thick 3,000 psi concrete, prime coat, and 2-inches bituminous concrete overlay, and as indicated on the Drawings.

1. Pavement patch shall extend 9" to 1'-0" beyond each side or edge of trench, and to abut flush with edge where existing paving was cut out as required, to a neat straight line.

1.3 QUALITY CONTROL:

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of bituminous materials and other manufactured items, certifying that these products comply with specifications and standards listed hereinafter.

1. All asphalt used for pavement shall be produced by a plant certified by the Alabama Department of Transportation (ALDOT).

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the "Alabama Highway Department Standard Specifications for Highway Construction", latest edition.

C. Testing: All laboratory and field testing required to insure compliance with these specifications will be performed by an independent testing laboratory. Refer to Section 01015 - "Special Conditions," for additional information.

1.4 JOB CONDITIONS:

A. Any base or sub-base areas damaged by weather or construction operations shall be scarified, remixed and recompacted in accordance with requirements before application of the prime coat.

B. Special care and attention shall be given to be certain that paving operations and/or equipment do not cause damage to any existing and/or new buildings, structures, or improvements which are to remain.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Provide the paving system(s) indicated on the Drawings, and where indicated, generally to match existing base and paving; Installed in accordance with Part 3 of this Section 02511, and referenced standards.

PART 3 - EXECUTION

3.1 PRIME COAT:

A. Application rates and construction requirements shall be as specified in Alabama Highway Department Specification Section 401, Bituminous Surface Treatments, for a Bituminous Treatment Type "A" which is a prime coat.

3.2 TACK COAT:

A. Construction requirements, including preparation of the existing surface or substrate and maximum application rates, are specified in Article 405.03 of the Alabama Highway Department Specifications.

3.3 PLANT MIX BITUMINOUS CONCRETE BINDER LAYER AND BITUMINOUS CONCRETE WEARING SURFACE:

A. Construction details, including finished surface tolerance, density requirements, and maintenance and protection shall be as specified in Articles 410.03 through 410.07, and 424.04. Rate of application shall be not less than the number of pounds per square yard for a 1-inch wearing surface or pavement patching layer, pro-rated for other thicknesses, as indicated, or if not indicated, as required by referenced Alabama Highway Department Specifications.

3.4 CRUSHED AGGREGATE BASE:

A. Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 825 and Article 301.

1. Compaction: 100% Modified Proctor Density (M.P.D.).

3.5 MODIFIED ROADBED:

A. Construction requirements shall comply with the Alabama Highway Department Specifications for the materials indicated, including in part, applicable portions of Article 230.03.

1. Depth: 12" unless greater depth is indicated on the Drawings or in the "Report of Subsurface Exploration".
2. Compaction: 98% Standard Proctor Density (S.P.D.)

3.6 COMPACTION EQUIPMENT:

A. Compaction equipment shall be self-propelled, capable of compacting the mixture throughout the depth of the layer while it is still in a workable condition without damage to the material.

1. Self-propelled rollers shall have a minimum weight of 10 tons.

3.7 PAVEMENT PATCH:

A. Saw cut perimeter of existing paving to a neat straight line where removal is indicated and/or required.

1. Protect edges of paving and base exposed to prevent cracking, breaking-up, wash-out, erosion, and/or other damage; apply prime coat as specified and at all such vertical edges prior to placing new pavement.

B. Patch pavement with components stated in Paragraph 1.2-B above, in compliance with each component's specified requirements, and as per details and sections on Drawings, if any.

END OF HOT-MIXED ASPHALT PAVING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02515

FACILITY FIRE SUPPRESSION WATER-SERVICE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor into the building.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water.
2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

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

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.5 DELIVERY, STORAGE, AND HANDLING

A. 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.

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

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

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.

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

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

D. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.

1. Gaskets: AWWA C111, rubber.

E. Flanges: ASME B16.1, Class 250, cast iron.

2.2 JOINING MATERIALS

A. Gaskets for Ferrous Piping: ASME B16.21, asbestos free

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to, and ends compatible with, piping to be joined.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Division 2 Section "Earthwork."

3.2 PIPING INSTALLATION

A. Comply with NFPA 24 for fire-service-main piping materials and installation.

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

C. Bury piping with depth of cover over top at least 30 inches (750 mm), with top at least 12 inches (300 mm) below level of maximum frost penetration, and according to the following:

D. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.

1. Terminate fire-suppression water-service piping at 12” above building floor slab until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.

E. 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, as required by NFPA-24.

F. Comply with requirements in Division 13 Sections for fire-suppression-water piping inside the building.

G. Install sleeve seals for piping penetrations of concrete footings and slabs. Comply with requirements for sleeve seals specified in Division 15. Avoid penetration of footings and structural components where possible.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, transition, and special fittings that have pressure rating same as or higher than systems pressure rating for belowground applications unless otherwise indicated.

B. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

C. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

D. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

E. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

F. Do not use flanges or unions for underground piping.

3.4 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs, caps, bends, in fire-suppression water-service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

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

3.5 CONNECTIONS

A. Connect fire-suppression water-service piping to site water provided by civil utilities contractor at 5’-0” outside the building.

3.6 FIELD QUALITY CONTROL

A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.

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

C. Hydrostatic Tests: Test at not less than 200 psi for two hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for two hours; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare test and inspection reports.

3.7 IDENTIFICATION

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

3.8 CLEANING

A. Clean and disinfect fire-suppression water-service piping as follows:

1. Purge new piping systems 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 AWWA C651 or do as follows:

    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 three 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.

3.9 PIPING SCHEDULE

A. Underground fire-suppression water-service piping shall be the following:

1. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints (250 psig rated).
2. Ductile iron fittings with mechanical joints may be used where practical.

END OF FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02520

PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 02200 - "Earthwork"
2. Section 03310 - "Concrete"
3. Section 07900 - "Joint Sealers"

1.2 DESCRIPTION OF WORK:

A. Extent of portland cement concrete paving is shown on drawings, including exterior walks, paving, entry pads, dumpster pads, and mechanical equipment pads.

1. Stamped, integrally colored concrete exterior walks, with shake-on color hardener/curing compound, only at locations where indicated on the Drawings.

1.3 SUBMITTALS:

A. Product Data: Include manufacturer's complete current product data, material descriptions, chemical composition, physical properties, test data, and mixing and application instructions.

1. Include manufacturer's current color charts for integrally colored concrete.

2. Include manufacturer's current color charts for shake-on color hardeners.

3. Include manufacturer's current selections for any locations indicated to receive concrete pattern stamps.

B. Samples for Verification: Cured samples of each color and pattern selection, approximately 2-feet x 2-feet in size, for acceptance, and for use in verifying the completed work.

C. Product Certificates: Signed by manufacturers certifying that products furnished comply with requirements and are recommended by manufacturer for uses indicated.

D. Qualification Data: For installers and manufacturers, 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. For products required to be installed by workers approved by product manufacturers, include letters of acceptance by product manufacturers certifying that installers are approved to apply their products.

E. Concrete mix designs.

1.4 QUALITY ASSURANCE:

A. Codes and Standards: Comply with "Alabama Highway Department Standard Specifications for Highway Construction" (ALDOT), latest edition, and local governing regulations if more stringent than herein specified.

B. Comply with the more stringent requirements of at least the following, either the latest edition or latest adopted edition of the locality, and all revisions and amendments thereto:

1. Uniform Federal Accessibility Standards (UFAS).

2. Americans With Disabilities Act of 1990 (ADA) "Accessibility Guidelines" (ADA-AG), and all revisions and amendments thereto.

3. U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA "Accessibility Guidelines" (ADA-AG), Published in the Federal Register July 23, 2004, and revisions and amendments thereto.

4. American National Standards Institute (ANSI), ANSI A 117.1, 2003.

5. International Building Code, as applicable at the project locale.

C. Testing: All laboratory and field testing required to insure compliance with these specifications will be performed by a qualified independent testing laboratory. Refer to Division 1 for additional information and requirements.

D. Refer to Division 1 Section "Special Conditions" for additional information and minimum experience requirements.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Forms:

1. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

2. Use flexible spring steel forms or laminated boards to form radius bends as required.

3. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh:

1. Welded plain cold-drawn steel wire fabric, ASTM A 185.

a. Size: 6" x 6" W1.4 / W1.4 at sidewalks, pedestrian only traffic areas and mechanical pads, and 6" x 6" W2.9 /W2.9 at vehicular paving areas and dumpster pads, unless heavier mesh is indicated on the Drawings.

2. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect, for all concrete paving subject to possibility of bearing the weight of vehicular traffic.

3. Furnish in rolls for all concrete paving accessible only to pedestrian traffic, unless indicated otherwise on structural drawings.

4. Locations for Use: All concrete pads and paving, at 1/3 of total depth of concrete from top of slab.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40 or 60.

D. Concrete Materials: Comply with requirements of Section 03310 - "Concrete", for concrete mix design, materials, admixtures, bonding materials, and other materials as required.

1. Integrally colored concrete for walks as indicated, or if not indicated, as selected by Architect from manufacturer's standard colors after bidding.

2. Stamped concrete walk pattern as indicated, or if not indicated, as selected by Architect from manufacturer's standard patterns, after bidding.

E. Expansion Joint Materials: Comply with requirements of Section 07900 - "Joint Sealers" for preformed and pourable expansion joint fillers and sealers.

F. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

G. Patterned Concrete Stamp Mats: Provide durable semi-rigid polyurethane mats with projecting textured and ridged underside, capable of imprinting texture and joint patterns on plastic concrete, equivalent to standard "random slate", approximately 9" x 9" "slate tile", or equivalent priced patterns, of one of the following:

1. Bomanite Corporation
2. Increte Systems, Inc
3. Patterned Concrete Industries, Ltd.
4. Scofield, L.M. Company
5. Specialty Concrete Products, Inc.
6. Symons Corporation

H. Color Hardener: Equivalent to "Lithochrome Color Hardener", as manufactured by L.M. Scofield Company.

I. Sealer/Water Repellent for Colored and Patterned Concrete: 40% Silane solution, VOC compliant, with UV-sensitive fugitive dye, equivalent to product specified in Section 04200 - "Unit Masonry".

J. Epoxy Adhesive: Provide best quality two-part product, as indicated in current edition of Alabama State Highway Department's "Standard Specifications for Highways and Bridges."

2.2 CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of Section 03310 - "Concrete", for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:

1. Sidewalks, curbs and gutters, entry pads, mechanical equipment pads, and below unit pavers' substrates (crushed limestone unless otherwise indicated) - and subject only to pedestrian traffic:

   a. Compressive Strength: 3,000 psi, minimum at 28 days.
   b. Slump Range: 3" to 5".
   c. Air Content: 5% to 6%.
   d. Thickness: 4", unless indicated otherwise.
   e. Compacted Subgrade: 4" porous fill on compacted subgrade (98% S.P.D.).

2. Paving, pads, and below unit pavers' substrates (crushed limestone unless otherwise indicated) - and subject to vehicular traffic, valley gutters, dumpster pads, and where indicated:

   a. Compressive Strength: 4,000 psi, minimum at 28 days (minimum 600 psi flexural strength).
   b. Slump: Less than 4".
   c. Air Content: As required by referenced standards.
   d. Thickness: 6", unless greater thickness is indicated on the Drawings.
   e. Subgrade: Unless otherwise indicated on the Drawings, 4" ALDOT 825 crushed aggregate base, over properly prepared and tested subgrade, including in part, in compliance with applicable portions of Article 825 and Article 301; Compaction to 100% Standard Proctor Density. Refer to Project Manual Section 02010 for additional information and requirements.

3. Colored Concrete: Ready-mix concrete supplier's standard integrally colored concrete mix design, colors as selected by Architect after bidding, and otherwise in compliance with the above requirements for mix design based on location and use of the completed concrete work.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

C. Subgrade shall be approved by Architect's representative before paving is begun.

3.2 FORM CONSTRUCTION:

A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8" in 10'.

2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.3 REINFORCEMENT:

A. Locate, place and support reinforcement as specified in Section 03310 - "Concrete", unless otherwise indicated. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.

3.4 CONCRETE PLACEMENT:

A. Comply with requirements of Section 03310 - "Concrete", for mixing and placing concrete, and as herein specified.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase, if required, to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

C. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with core to prevent dislocation of reinforcing, dowels, and joint devices.

1. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

3.5 JOINTS:

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints:

1. Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows below.

2. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

3. Sidewalks shall be scored at 5-foot intervals unless otherwise indicated.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

D. Expansion Joints:

1. Provide expansion joints with premolded joint filler at locations abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

2. Extend joint fillers full-width and depth of joint.

3. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

4. Expansion joints for sidewalks shall be placed at 30-foot maximum intervals and along all intersections with other walks, steps, curbs, or other vertical surfaces.

E. Fillers and Sealants: Comply with the requirements of Section 07900 - "Joint Sealers", for preparation of joints, materials, installation and performance.

3.6 CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Using hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs and formed joints with an edging tool, and round to 1/4" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Light and smooth broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation as required to provide a fine line texture acceptable to Architect.

2. Stamped pattern (if any), only at locations indicated on the Drawings, as indicated, or if not indicated, as selected from manufacturer's standard patterns by the Architect after bidding.

3. Lightly rework slab edges and all joints with 2-inch wide flat edging tool, so as to remove approximately half of the broom finish relief, leaving a light broom finish and a 2-inch wide pattern framing slab panels at all edges and joint locations.

a. Provide above 2-inch wide pattern framing slab panels at all edges and joint locations, at all locations of concrete sidewalks, pads and paving, including areas of stamped, unstamped, integrally colored and natural colored concrete, etc.

E. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

F. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

1. Provide rubbed finish for exposed edged of concrete work, and apply light and smooth broom finish.

3.7 PATTERNED AND/OR COLORED CONCRETE:

A. Provide colored hardener, any stamp patterns, joint patterns, and sealer in compliance with current written instructions and recommendations of the manufacturer of each product or system.

1. Walking surface shall be flat, and flush with adjacent concrete walks and paving.

3.8 CURING:

A. Protect and cure finished concrete paving, complying with applicable requirements of Division 3 Section "Cast-In-Place Concrete". Use curing and sealing compound or approved moist-curing methods.

B. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

3.9 REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective concrete, as directed by Architect.

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 resign grout.

C. Protect concrete from damage until acceptance of work. 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.

1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF PORTLAND CEMENT CONCRETE PAVING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02580

PAVEMENT MARKING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work described in this section includes marking of graphic symbols, lane separations, parking stripes, and lettering on concrete and asphalt pavements, if any, at locations indicated and as shown on the Drawings.

B. Related work specified elsewhere includes:

1. Section 02511 - "Hot-Mixed Asphalt Paving"
2. Section 02520 - "Portland Cement Concrete Paving"

1.2 QUALITY CONTROL:

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of materials, certifying that these products comply with specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be Alabama Highway Department "Standard Specifications for Highway Construction", latest edition.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Paint for pavement marking shall be, traffic marking paint complying with Section 856, of the Alabama Highway Department specifications, and as follows:

1. Class 1, Type A (reflective) in public Right-of-Ways, unless otherwise specified by authorities having jurisdiction.

2. Class 1, Type B (non-reflective) within property lines of this project's site.

3. Comply with requirements of ALDOT and locality where project is located, if more stringent than above.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING:

A. Each individual painted parking stripe shall be 4-inches wide, and shall be laid out as indicated on drawings. Construction requirements shall conform to the applicable parts of Article 701.03 of the Alabama Highway Department Specifications for Class 1, Type as specified, traffic stripe.

1. Color shall be white for asphalt, yellow for concrete pavement, and international blue for striping and graphics for parking spaces for the disabled and handicapped.

2. Use same materials and construction methods for any arrows and symbols indicated on paved areas.

3. Mark paving at each space for the disabled and handicapped (H.C.) with acceptable international graphics symbol, unless otherwise indicated, approximately 4' x 4' in size. Locate centered in space width and approximately 2'-0" from end of space where vehicle enters.

END OF PAVEMENT MARKING

SECTION 02668

WATER SERVICE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 02520 - "Portland Cement Concrete Paving" (*and pavement patch*)
2. Section 03310 - "Concrete"
3. Division 15 - "Mechanical"

1.2 SUMMARY:

A. This Section includes water service piping system, meter, vaults, valves, and appurtenances from the existing on-site utility source of potable water to a point 5 feet outside the building, and as indicated on the Drawings, and in this Section 02668 of the Project Manual.

B. Note that the Contractor shall furnish and install connection, any required new water meter, etc., acceptable to the utility company and call on the utility company to approve any required new meter and inspect the installation prior to covering.

C. All fees and charges for water service, meters, taps, permits, impact fees, etc., shall be paid by the Contractor from their contract amount.

D. The extent of water service piping system, any fire hydrants, etc., is indicated on the Drawings, in this Section 02668, other referenced Sections of the Project Manual, and as otherwise required by authorities having jurisdiction.

1. All water pipe which run under roads, streets, driveways, and other vehicular paving shall be sleeved in AWWA C151 ductile iron sleeves.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS - GENERAL:

A. General: Pipe, valves, fittings and installation in R.O.W. and on site shall comply with requirements of this Section 02668, other referenced Sections of the Project Manual, the Drawings, and the local utility company.

1. Pipe, fittings and valves shall be as specified herein, subject to acceptance by the local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.
2. PVC water piping and fittings smaller than 4" shall be either SDR 21 Pressure Pipe, Class 200 (ASTM D-2241), ***or*** Schedule 40 PVC 1120 Pressure Pipe, Class 200 (ASTM D-

1785); and pipe for fire lines, below paving and where indicated shall be AWWA C151 ductile iron, of type(s) acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.

3. PVC water piping and fittings 4" and larger shall be C900, Class 200 plastic pipe of type acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.
4. Ductile iron pipe for fire lines, pipe below paving and where indicated shall be AWWA C151 ductile iron, of type(s) acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.
5. Note that all water pipe which run under roads, streets, driveways, and other vehicular paving shall be either ductile iron or shall be sleeved in ductile iron sleeves.
6. Copper pipe where indicated, provide Soft Copper Tube, ASTM B 88, Type K, water tube, annealed temper.

    a. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. PVC Plastic, Water Pipe: Include elastomeric seal according to ASTM F 477.

1. Ductile Iron Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type, and specifically designed for joining PVC pipe; Include elastomeric seals according to ASTM F 477 or as otherwise required for joining plastic pipe specified.
2. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended in writing by piping system manufacturer, unless otherwise indicated.

C. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

D. Pipe Sleeves: Provide pipe sleeves at least one size larger than water service piping required below existing concrete and paving, and as follows.

1. Below Concrete, Entry Pads, and Paving Subject to Only Pedestrian Traffic, and for any Future Irrigation indicated: Schedule 40 PVC.
2. Below Concrete, Equipment Pads, Dumpster Pads, Valley Gutters, Curbs and Gutters, Paving Subject to Vehicular Traffic, and Where Indicated: Ductile Iron, as specified above herein this Section 02668.

E. Identification for Underground Plastic Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allen Systems, Inc.; Reef Industries, Inc.
    b. Brady (W.H.) Co.; Signmark Div.
    c. Calpico, Inc.
    d. Carlton Industries, Inc.
    e. EMED Co., Inc.
    f. Seton Name Plate Co.

2. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in blue letters "CAUTION - WATER LINE BURIED BELOW."

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Comply with requirements of Division 15, the International Plumbing Code, Drawings, and requirements of authorities having jurisdiction.

3.2 DEPTH OF COVER:

A. Provide minimum cover of 30-inches for all water bearing piping.

3.3 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.4 CLEANING:

A. Clean and disinfect water distribution piping as follows, or as required by utility company, Code, and authorities having jurisdiction:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:

    a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
    b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
    c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
    d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

B. Prepare reports for all purging and disinfecting activities, and submit for review and along with each set of "Record Documents".

END OF WATER SERVICE PIPING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02720

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 02200 - "Earthwork"
2. Section 03310 - "Concrete"
3. Section 09900 - "Painting"
4. Division 15 - "Mechanical"

1.2 SUMMARY:

A. Work described in this Section includes the construction of new storm drainage systems, piping, structures, taps, downspout boots, and appurtenances, from a point 5 feet outside the future buildings to the point of connection to existing storm sewer, on-grade or other outlet, as indicated on the Drawings.

1. In the event of conflict between this Section and Drawings, the more stringent requirements shall be provided

B. Each bidder shall visit the site to determine the extent of work required for completion of this contract.

C. The extent of storm drainage system is indicated on the Drawings, in this Section 02720, and as otherwise required by authorities having jurisdiction.

D. All fees and charges for storm sewerage permits, connections, impact fees, inspections, etc., shall be paid by the Contractor from their contract amount.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for drainage piping and specialties.
2. Shop drawings for precast concrete storm sewer manholes, including frames and covers.

a. Shop drawings for cast-in-place concrete or field-erected masonry storm sewer manholes, if any, including frames and covers.

1.4 QUALITY ASSURANCE:

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of pipe, gaskets, reinforcing steel, cast iron frames, covers and grates, ready-mix concrete and other manufactured items, certifying that these products comply with the Specifications and Standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Alabama Department of Transportation (ALDOT) "Standard Specifications for Highway Construction", Latest Edition.

C. Testing: All laboratory and field testing as required to insure compliance with these Specifications will be performed by an independent testing laboratory. Refer to Section 01015 - "Special Conditions", for additional information.

D. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm sewerage systems.

E. Utility Compliance: Comply with local utility regulations and standards pertaining to storm sewerage systems.

F. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

G. Refer to Division 1 Section "Special Conditions" for additional information and for minimum experience requirements.

1.5 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that storm sewerage system piping is installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate any connection to public storm sewer with utility company.

B. Coordinate with interior building storm drainage piping, and exterior building storm drainage piping, to include in part, coordination of types of connections required adjacent to foundations and footings.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Plastic Pipe: Provide one of the following, unless indicated otherwise on the Drawings:

1. Equivalent to ADS N-12 (unperforated) corrugated HDPE pipe with smooth interior, and all required or necessary system accessories, downspout adaptors, fittings, and components,

specified in ALDOT Standard Specifications Article 853.04, unless otherwise indicated on the Drawings.

2. Equivalent to Contech A2000 PVC (unperforated), ASTM F949, specified in ALDOT Standard Specifications Article 852.07 and all required or necessary system accessories, downspout adaptors, fittings, and components, with watertight gasketed joints, unless otherwise indicated on the Drawings.

B. Reinforced Concrete Pipe (RCP), or Equivalent Area/Volume Arch Pipe (RCAP) Where Permitted: Class 3, reinforced concrete pipe as specified in ALDOT Standard Specifications Article 850.01, unless otherwise indicated on the Drawings.

C. Where indicated on the Drawings for "french drain", "underdrain", foundation drain, at planting or other areas, pipe shall be equivalent to ADS N-12 (perforated) corrugated HDPE pipe with smooth interior, complete with filter fabric "sock" and all required or necessary system accessories, fittings, and components, specified in ALDOT Standard Specification Article 853.13, or equivalent Contech A2000 PVC (perforated) with same filter sock, components and accessories.

1. Where underdrain is indicated, line trench with acceptable geotextile filtration fabric, backfill with clean washed "pea gravel", fold edges of fabric over top of gravel, and cover with acceptable and relatively impervious earth fill, up to subgrade level of grass or paving.
2. Synthetic Drainage Fabric: Equivalent to fabric supplied as a component of filter fabric "sock", but not less than 4.3 oz. per square yard per ASTM D 3776, and flow rate of 120 gpm and permitivity of 1.62 per ASTM D 4491.

D. Concrete and reinforcing steel for headwalls, inlets, manholes, and other storm drainage structures shall comply with Alabama Department of Transportation Standard Specification Articles 501 and 502. Concrete shall be Class "A", Type 2 (3,000 psi).

E. Masonry materials (if any shown) and precast concrete units shall conform to Article 621.02.

F. Castings for frames, covers and grates in drainage structures shall comply with Section 836, with particular attention directed to Article 836.04, 836.05, 836.06, and 836.07.

1. All manhole covers shall be round.

G. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in black letters "CAUTION - STORM SEWER LINE BURIED BELOW."
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allen Systems, Inc.; Reef Industries, Inc.
    b. Brady (W.H.) Co.; Signmark Div.
    c. Calpico, Inc.
    d. Carlton Industries, Inc.
    e. EMED Co., Inc.
    f. Seton Name Plate Co.

H. Downspout Boots, where indicated on the Drawings: HDPE downspout boots, compatible with HDPE or PVC pipe utilized, appropriately sized for rectangular downspout at top and round pipe at outlet, including all accessories, anchors, any required adapter sleeves, etc.

1. Product/Manufacturer: Equivalent to standard drainage system products/accessories as manufactured by ADS or Contech.

PART 3 - EXECUTION

3.1 STORM DRAIN PIPE:

A. Construction requirements, including excavation of trench, placing pipe, and backfilling around pipe shall conform to the applicable portions of Article 530.03 of the ALDOT Standard Specifications.

1. Additional Requirements for Plastic Pipe and Fittings: Comply with pipe manufacturer's current written instructions and recommendations, when more stringent than referenced ALDOT Standard Specifications.

B. A minimum of 4-inches of "select fill" bedding material shall be placed under all pipes. Backfill with "select fill" unless otherwise indicated on the Drawings.

C. Compaction requirements for backfill shall be the same as specified for type of surface constructed over the trench, paved or planted areas as described in Section 02200 - "Earthwork."

D. Properly coordinate with elevations of finished grades, footings, and below grade work.

3.2 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground plastic storm sewer piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.3 STRUCTURES:

A. Inlets, manholes, cleanouts and other storm drainage structures shall be installed or constructed in accordance with applicable portions of the following sections of the Alabama Department of Transportation Standard Specifications, Latest Edition:

1. Article 501 - Structural Portland Cement Concrete.
2. Article 502 - Steel Reinforcement.
3. Article 613 - Brick and Concrete Block Masonry.
4. Article 620 - Minor Structure Concrete.
5. Article 621 - Inlets, Junction Boxes, Manholes and Miscellaneous Drainage Structures.
6. Article 622 - Resetting Gratings and Covers and for Catch Basins, Inlets, and Manholes.

END OF STORM DRAINAGE

SECTION 02730

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 01732 - "Selective Demolition"
2. Section 02511 - "Hot-Mixed Asphalt Paving" (*and pavement patch*)
3. Section 02520 - "Portland Cement Concrete Paving" (*and pavement patch*)
4. Section 03310 - "Concrete"
5. Division 15 - "Mechanical"

1.2 SUMMARY:

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

B. The extent of sanitary sewerage system is indicated on the Drawings, in this Section 02730, and as otherwise required by authorities having jurisdiction.

C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the Contractor from their contract amount.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for drainage piping and specialties.
2. Shop drawings for precast concrete sanitary manholes, including frames and covers.

    a. Shop drawings for cast-in-place concrete sanitary manholes, if any, including frames and covers.

1.4 QUALITY ASSURANCE:

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.

B. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.

C. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

1.5 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate any connection to public sewer with utility company.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cleanouts:

   a. Ancon, Inc.
   b. Josam Co.
   c. Smith (Jay R.) Mfg. Co.
   d. Wade Div.; Tyler Pipe.
   e. Zurn Industries, Inc.; Hydromechanics Div.

2. Underground Warning Tapes:

   a. Allen Systems, Inc.; Reef Industries, Inc.
   b. Brady (W.H.) Co.; Signmark Div.
   c. Calpico, Inc.
   d. Carlton Industries, Inc.
   e. EMED Co., Inc.
   f. Seton Name Plate Co.

2.2 PIPE AND FITTINGS:

A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of materials or products is indicated below, refer to drawings for locations of each one, or if not indicated, selection is Installer's option.

B. Pipe 8-inches and smaller, unless indicated otherwise:

1. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 26, for solvent cement or elastomeric gasket joints.
2. Solvent Cement: ASTM D 2564, for pipe 4-inches and smaller.
3. Gaskets: ASTM F 477, elastomeric seal, for pipe larger than 4-inches.

C. Couplings: Rubber or elastomeric sleeve and stainless steel band assembly fabricated to match outside diameters of pipes to be joined.

1. Sleeves: ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
2. Bands: Stainless steel, one at each pipe insert.

D. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.

E. Ductile-Iron, Gravity Sewer Pipe and Fittings:

1. Pipe: ASTM A 746, for push-on joints.
2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
3. Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets: AWWA C111, rubber.

F. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

G. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in red letters "CAUTION - SANITARY SEWER LINE BURIED BELOW."

2.3 MANHOLES (if any):

A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints. All manhole covers shall be round.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having a 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: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.
5. Gaskets: ASTM C 443, rubber.
6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch equally spaced intervals.
7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.

B. Cast-in-Place Manholes (if any): Reinforced concrete of dimensions and with appurtenances indicated. All manhole covers shall be round.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channel and Bench: Concrete.
3. Steps: Cast into sidewall at 12- to 16-inch equally spaced intervals.

C. Concrete: Portland cement mix, 3000 psi.

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.
5. Refer to Section 03310 - "Concrete" for additional information and requirements.

D. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
3. Refer to Section 03310 - "Concrete" for additional information and requirements.

2.4 MANHOLE STEPS:

A. General: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Ductile iron or cast aluminum.

2.5 CLEANOUTS:

A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.

2.6 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters "CAUTION - SEWER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS:

A. Refer to Paragraph 2.2 above.

3.3 INSTALLATION, GENERAL:

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

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations 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, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

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

E. Install piping pitched down in direction of flow, at minimum slope of 2 percent, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION:

A. Join and install PVC pipe as indicated in Part 2 above, and the following:

1. Solvent cement joint pipe and fittings, joining with solvent cement in accordance with ASTM D 2855 and ASTM F 402.
2. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212, and for truss pipe ASTM D 2680, Appendix XI.
3. Installation in accordance with ASTM D 2321.

B. Join and install ductile iron pipe as indicated in Part 2 above.

3.5 MANHOLES:

A. General: Install manholes complete with accessories as indicated, of if not indicated, in compliance with project requirements and authorities having jurisdiction. Form continuous concrete or split

pipe section channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.

1. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.
2. Construct cast-in-place manholes as indicated.
3. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.
4. Install manhole steps as indicated.

3.6 CLEANOUTS:

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout frame and cover in concrete block 18 by 18 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.7 TAP CONNECTIONS:

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the 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 3000-psi 28-day compressive-strength concrete.

C. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

1. Provide 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.

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

3.8 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.9 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other 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 plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

END OF SANITARY SEWERAGE

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 02900

LANDSCAPE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary and General Requirements apply to the work specified herein.

1.2 DESCRIPTION:

A. Provide all labor, equipment, materials and services necessary to complete the Work of this Section, including:

1. Providing, placing, grading topsoil and/or sand for landscape grading as indicated in the Drawings.
2. Providing and installing trees, shrubs, ground covers, solid sod and any indicated seeding, for landscape planting.
3. Maintenance for **ninety (90) days** after Substantial Completion, and during the **one (1) year** Guarantee Period after project Substantial Completion. The maintenance responsibility includes watering, weeding, trimming, pruning, mowing, fertilizing, etc.

1.3 SUBMITTALS:

A. Qualification Data for firms specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include a list of a minimum of five (5) similar projects completed with the last five (5) years with project name, address, names of Architects and Owners, overall description of scope of work, and contract value.

B. Materials Lists:

1. Within ten (10) days of award of Contract, submit a complete list of materials and unit prices demonstrating source, availability, and complete conformance with requirements specified.
2. Substitutions not permitted unless proof is submitted to the Landscape Architect's satisfaction that the material is unavailable as specified.

C. Certificates: Deliver all certificates of inspection to the Architect.

D. Product Data:

1. Submit manufacturer's product literature, instructions and guaranteed analysis for fertilizer.

1.4 DEFINITIONS:

A. Trees, shrubs, groundcovers, and sod are plant materials listed in Plant Schedule on Drawings.

1.5 JOB CONDITIONS:

A. Coordinate the Work of this Section with that of other trades.

B. Examine conditions under which Work is to be performed and notify Landscape Architect and Landscape Architect in writing of unsatisfactory conditions.

C. Do not perform Work until conditions are satisfactory and acceptable.

D. Notify utility companies, prior to digging, for locations of underground utilities (electrical power, telephone, cable, water, sewer and gas) and perform Work in a manner which will avoid all possible damage. Hand excavate as required.

E. Maintain stakes or other location markers and controls set by others until removal is mutually agreed upon by all parties.

1.6 QUALITY ASSURANCE:

A. Codes and Standards:

1. Applicable Sections of Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2012 Edition as amended.
2. All plant materials to comply with State and Federal laws relating to inspection for disease and insect control.
3. Plant material quality to conform to *American Standard for Nursery Stock*, American Association of Nurserymen, Inc., 1986, ANSI Z-60.1.1
4. Plant Material nomenclature to conform to:

    a. *Hortus Third*, a Concise Dictionary of Plants Cultivated in the United States and Canada, Macmillan Publishing Company, Inc., New York, 1976 Edition.
    b. Names not listed in the above standard to comply with those most commonly used in the trade.
    c. In all cases, botanical names take precedence over common names.

B. Installer Qualifications: Firm shall hold Alabama General Contractor's License for Classification S - Specialty Construction, Subclassification 4 - Landscaping. Firm experienced in the successful installation of a minimum of five (5) projects within the past five (5) years similar in scope, quality, and contract value to that indicated for this project. Firm shall have sufficient labor, equipment and financial resources to complete the Work of this Section.

C. Personnel: Use adequate numbers of skilled workers trained and experienced in the Work and familiar with requirements and methods needed for performance of the Work. At all times during planting operations, have on the site a person knowledgeable in horticultural practices as a superintendent.

D. Inspection and Approval:

1. All plant material is subject to inspection and approval in the field or nursery before digging, by the Landscape Architect.
2. All plant materials and other materials are subject to inspection and/or rejection at the site before planting or placing, or at any other time.

3. Attach secure, durable, legible waterproof labels, stating correct botanical and common names as specified, to a least one (1) plant, bundle or container of each plant variety.
4. Remove from site plant materials or other materials not complying with specified requirements within 5 days of rejection.
5. Approval is for visual qualities only and does not relieve the Contractor of their obligation to provide materials and workmanship in full compliance with the requirements of the Contract Documents.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver packaged materials in manufacturer's original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at the site.

B. Deliver all non-packaged or non-containerized materials to site in a manner that will prevent loss, damage, deterioration or contamination.

C. Store all materials in approved locations to prevent loss, damage, deterioration or contamination.

D. Deliver, storage and handling of all plant materials shall conform to ALDOT Specification Section 860.06(c) and the following:

1. Deliver freshly dug plants, which have not been in cold storage or heeled-in.
2. Do not prune prior to delivery.
3. Do not bend or bind trees or shrubs in such a manner as to damage bark, break branches or destroy natural shape.
4. Provide necessary protective covering during transport and delivery.
5. Deliver plants after preparations for planting have been completed and approved, and plant immediately.

1.8 SITE MAINTENANCE:

A. Keep roads, paving and structures adjacent to maintenance operations clean and free of obstructions, mud and debris at all times.

B. Do not permit flushing of roads or disposal of dirt or debris into sewers or drainage ditches.

C. Control dust from maintenance operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS:

A. Topsoil:

1. This Contractor shall furnish topsoil in sufficient quantity, to complete grading and planting operations as specified. A minimum of 4” of topsoil is required below sod.
2. Characteristics of topsoil to be furnished:

a. Fertile, friable, naturally occurring. Free of stones, clay, lumps, hardpan, roots, stumps, branches, sticks and other debris larger than two (2) inches in any dimension; free of noxious weeds, grasses, seeds, plants, extraneous matter and any substance harmful to plant growth. Topsoil from open fields will not be accepted.

b.	Ph:	5.0 to 7.0
c.	Organic Matter:	5% to 10%
d.	Sand:	50% to 70%
e.	Silt:	less than 30%
f.	Clay:	10% to 25%

g. Permeability Rate of 5 x 10 <-3> centimeters or greater at 85% compaction.

B. Notify Landscape Architect of location of proposed topsoil for their inspection before testing or transporting to site.

C. Topsoil testing for furnished topsoil: Sample and test, minimum of three (3) samples, for compliance with specified characteristics. Tests to be performed by soil testing lab approved in advance by Engineer, by this Contractor at their expense. Submit Soil Test Reports to Landscape Architect for approval before transporting topsoil. Amend per recommendations of Soil Test Report and as approved to meet specified characteristics.

2.2 SOIL AMENDMENTS:

A. Fertilizer:

1. Characteristics:

a. Uniform in composition.
b. Dry and free-flowing.
c. Commercially available.
d. Conforming to the State of Federal Fertilizer Laws.

2. Of the formulation recommended in the Soil Test Report as specified.

B. Lime:

1. Ground or crushed agricultural lime.
2. Containing not less than 85% of total carbonates.
3. 90% passing 20-mesh screen.
4. Not less than 50% passing a 60-mesh screen.
5. Dry and free-flowing.
6. Apply at rate specified in Soil Test Report.

2.3 LANDSCAPE PLANTING MATERIALS:

A. Water:

1. Provide fresh water, free of impurities or any substance harmful to plant growth.
2. Provide all hose, attachments, and accessories necessary to complete the Work as specified.

B. Topsoil: Refer to Paragraph 2.1.A, this Section, for specified topsoil for use in all planting operations.

C. Topsoil Mix:

1. Prepare all topsoil mix used in tree and shrub pits and ground cover beds in the following proportions:

   a. 2 parts by volume topsoil as specified. 2.1.A.
   b. 1 parts by volume decomposed organic matter, 2.3.E.

2. Add three (3) pounds of 12-6-6 fertilizer to each cubic yard of topsoil mix during the mixing process, for all plants.

D. Decomposed Organic Matter:

1. Well rotted organic matter.
2. Containing no weeds, grasses or plants, their seeds, or any substance harmful to plant growth.
3. Of uniform composition.
4. Acceptable Materials:

   a. Mushroom Compost
   b. Ground pine bark
   c. Approved equal.

E. Mulch:

1. Pine straw on slopes: Free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.
2. Ground Pine bark: Free from leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substances harmful to plant growth.

F. Solid Sod:

1. Obtain solid sod from sources having growing conditions similar to the area to be planted.
2. Sod shall be true to name and type of the species named in the plant Schedule.
3. Sod shall be 100 percent of the type specified and shall contain no other grasses.
4. Sod shall be well cultivated and weed, disease and insect-free, of good texture, and free from extraneous roots, stones and other foreign material. The presence of nutgrass or other weeds shall be cause for rejection and replacement prior to Substantial completion, or during the Guarantee Period.

G. Plant Material:

1. Definition: Trees and shrubs listed in the Plant Schedule in the Drawings.
2. General:

   a. Species, sizes, manner in which to be planted, and approximate quantities to complete the planting as indicated are included in the Plant Schedule.

b. Scientific and common plant names conform to those given in *Hortus Third*, or are those generally accepted in the nursery trade.

3. Quality:

a. Conform to the standards set forth in *American Standard for Nursery Stock.*
b. Standard quality and first-class representatives of their species or variety and true to name and type.
c. Nursery-grown, unless specified otherwise.
d. In compliance with State and Federal laws relating to disease and insect infestation; file certificates with Landscape Architect.
e. Having normal, well-developed branches and vigorous root systems, free from defects, decay, disfigurements, sun scaled, bark abrasions, plant diseases, insect pests or eggs, borers and any and all infestations.

4. Rejection of plants for:

a. Lack of compactness or proper proportion;
b. Week, thin growth in rows too close together;
c. Cut back from larger stock to meet specified requirements;
d. Undersized, dry, cracked or broken balls, or plants that are loose in their balls;
e. Root bound within container or ball;
f. Lacking proper proportion as to height and spread and specified characteristics or plant material;

5. Size:

a. Sizes and proportions of all plant materials shall equal those recommended by the *American Standard for Nursery Stock* for specified grades.
b. Measure plants before pruning, with branches in normal position.
c. Equal or exceed measurements specified in Plant Schedule, which are the minimum acceptable; provide 50-percent of plant material maximum size specified.
d. Height and spread dimensions: General body mass of plant, not from branch tip to tip.
e. Well-proportioned as to height; reject plants which meet specified measurements but do not possess an overall balance.

f. Take caliper measurement on trunk six-inches above natural ground level up to and including four-inch caliper size; twelve-inches above natural ground level for larger sizes.
g. B&B plants shall have firm natural balls of a diameter and depth not less than that recommended in *American Standard For Nursery Stock.*
h. Container-grown plants: Conform to standards set forth in *American Standard For Nursery Stock* for container-grown plants.

6. Quantity: Furnish plants in sufficient quantity to satisfy the intent of the Drawings and Specifications. Locate in sufficient quantity to that time is not lost if some plants are rejected.

H. Guying and Staking Materials:

1. Wood Stakes:

a. Pressure-treated Southern Yellow Pine, or other approved wood, 2-inches x 4-inches x length specified in the Drawings, pointed at one end.
b. Free from insects and fungi.

2. Wire: Pliable #10 or #12 gauge galvanized steel wire, doubled and twisted.
3. Turnbuckles: As detailed and approved by Landscape Architect.
4. Protective Hose:

a. Reinforced fiber-bearing rubber hose.
b. Black.
c. May be second-hand.
d. Not less than 2-inches inside diameter.

5. Arbor Tie (is acceptable).

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Planting Season:

1. A period of acceptable weather conditions, during seasons in which satisfactory results can be expected as determined by acceptable practice in the locality and approved by the Landscape Architect.
2. Commence planting operations as soon as portions of the site are available, as approved by the Landscape Architect.

B. Site Inspection:

1. Examine areas and conditions under which Work is to take place.
2. Inform Landscape Architect in writing, prior to planting, of conditions existing which could be considered detrimental to the successful planting and growth of any plant material, including but not limited to, subsurface drainage conditions, utility locations, subgrade compaction, percolation rate and elevations.

C. Site Preparation:

1. Subgrade will be established by the General Contractor at 4-inches below finished grade in all areas to receive planting around the building, and 6-inches for areas to be sodded, unless greater topsoil depth is indicated herein or on Drawings for deeper bed preparation.

a. Topsoil depth for shrub and groundcover beds and for sod is 6-inches and shall be provided by this Contractor .
b. Do not place or spread topsoil in an area until subgrade is approved by Landscape Architect and is acceptable to the Landscape Contractor.

2. Remove all vegetative growth from topsoil by approved means before commencing with planting operations.
3. Remove all unwanted vegetative growth from areas designated to receive new planting or sod with chemical herbicide or by other approved means, prior to scarifying and placing topsoil.
4. Remove extraneous matter measuring 1-2-inch or larger in any dimension from top 4-inches of placed topsoil.
5. Uniformly grade areas including adjacent transition areas to line and grade shown on Drawings.
6. Obtain approval of finished grades before proceeding with planting operations; eliminate irregularities and ponding.
7. Protect stockpiled or spread topsoil from erosion by force of wind, water, or other force; re-establish eroded, rutted or settled grades to proper finished grade.

D. Topsoil Mix:

1. Prepare topsoil mix to specification 2.3.C off site, using approved topsoil.
2. Obtain approval of topsoil mix before delivery to site, and prior to commencing planting operations. Do not mix in place with placed topsoil.
3. Place topsoil mix as backfill for tree and shrub pits and beds as drawn. Place 2-inches of topsoil mix in all shrub beds unless otherwise indicated on the Drawings.
4. Protect stockpiled topsoil mix from erosion by force of wind of water, or damaged by traffic.

E. Plant Location Staking:

1. Stake plant locations and areas for approval prior to planting.
2. Do not dig plant pits prior to obtaining Landscape Architect's approval of plant locations.
3. Make adjustments in plant locations as directed.
4. If underground obstructions are encountered in planting areas that would prevent the installation of the plant material, contact the Landscape Architect immediately. Alternate locations may be selected by the LANDSCAPE ARCHITECTat no additional cost to the Owner.

F. Planting:

1. Place plants comprising a planting composition in approved staked locates for approval by Landscape Architect.
2. Planting pits and beds:

a. Drainage:

1) This Contractor is responsible for achieving and maintaining adequate drainage from all planting beds. Use specified drainage system, or other approved means, in all tree pits.
2) 48-hours prior to planting, test each plant pit for adequate drainage.
3) Owner reserves the right to test tree or plant pits at any time, before or after planting, for adequate drainage. Correct immediately any inadequate drainage encountered.

b. Pits are generally circular in outline with vertical sides.
c. Tree pits: 3-feet greater in diameter than ball or root spread.
d. Shrub pits: 1-foot greater in diameter than ball or root spread.
e. Excavate to specified dimensions and dispose of excavated material off site.
f. Prepare as specified in detail Drawings.

3. Setting plants:

a. Set plants uniformly 2-inches to 4-inches higher than surrounding grade or as necessary to provide adequate positive drainage away from roots. Slope soil gradually from saucer.
b. Cut rope, wire or string from top of ball after plant has been set; turn down and bury burlap.

4. Backfilling plants:

a. Backfill to 2/3 full with specified topsoil mix.
b. Water thoroughly to eliminate air pockets and settling before filling to grade.
c. Form shallow saucer at plant pit edge to hold water.
d. Water in thoroughly.

5. Staking:

a. Inspect tree trunks for injury, improper pruning and insect infestation; take corrective measure.
b. Immediately after planting, stake trees as detailed.

6. Pruning:

a. Do not prune plants without approval.
b. Prune after plants are in place and *ONLY* at the direction of Landscape Architect.
c. Main leaders of trees to remain intact.
d. Paint all cuts over 2-inch diameter with approved tree wound dressing.

7. Finished Grading: Hand grade and rake planting areas so that grades conform to surrounding areas and surface water drains freely.
8. Mulching:

a. Mulch all plant pits and beds with 4-inch deep specified mulch.
b. Spread mulch solid in planting beds.
c. Thickness is uniform throughout.
d. Mulch for trees shall be eight (8) feet in diameter from base of tree.

G. Solid Sod:

1. Procure and handle sod per ALDOT Section 860.05(b) 1-4.
2. Preparation of Sod Bed:

a. Spread and scarify amended topsoil as specified.

b. Rake and otherwise manipulate to form smooth-draining grades, remove all stones and clay lumps 1-inch in diameter or larger.
c. Leave the surface of the topsoil 1- 1/2-inches below finished grade.
d. Do not move heavy objects over areas to be sodded after the soil has been prepared. Planting in compacted areas will not be permitted.
e. The finished surface of the areas to be sodded shall be approved by the Landscape Architect prior to sod placement.

3. Solid Sod Placement:

a. Lay sod when sod bed is not excessively wet or frozen, but when soil is damp for a depth of 4-inches.
b. Immediately upon approval of bed preparation, lay sod smoothly, edge-to-edge, with staggered joints.
c. Press firmly into contact with sod bed by tamping or rolling by approved means to eliminate all air pockets, providing a true and even surface, and assuring knitting.
d. Fill cracks between sod blocks with strips of living sod, topsoil, or humus.
e. Water thoroughly by use of sprinkler or spray, without erosive force.
f. Protect from damage by traffic, or other causes.

3.2 LANDSCAPE MAINTENANCE:

A. Provide labor, materials, equipment and means for proper maintenance of all materials and workmanship included in the Work of this Section until Substantial Completion and the beginning of the **1-year maintenance period**.

B. Maintenance for **1 year** after Substantial Completion is included in the Work of this Section. The maintenance responsibility includes watering, weeding, trimming, pruning, mowing, fertilizing, etc.

3.3 SUBSTANTIAL COMPLETION AND GUARANTEE:

A. Substantial Completion and Payment:

1. Submit request for inspection of Substantial Completion, with a punch list of contract items to complete, to Landscape Architect at least 1-week prior to anticipated date of inspection.
2. Review the Work jointly with the Landscape Architect for Substantial Completion.
3. Upon completion of repairs and replacements found necessary at time of review, the Landscape Architect will confirm the Date of Substantial Completion of the Work.
4. Substantial Completion constitutes the beginning date of the **1-Year Guarantee Period**.

B. Basis of Acceptance:

1. Planted trees and shrubs will be counted as individual units, complete, in place and planted in accordance with plans and specifications. Each unit will include the installed plant, topsoil, topsoil mix, mulch and staking apparatus.
2. Solid sod will be counted in square yards provided and installed, including sod, ground preparation and topsoil, in accordance with plans and specifications.

3. Plant pit drainage will be counted as incidental to the Work, and will not be counted separately for payment.
4. The cost of mobilization (including all provisions of General Requirements, and Maintenance until Substantial Completion as specified herein are considered incidental to the Work and will not be counted as separate items for payment.

C. Guarantee:

1. Guarantee all materials and workmanship for a period of **1-year** from the Date of Substantial Completion.
2. During the period of the Guarantee, replace with no additional compensation, and as soon as weather permits, all dead plant materials and all materials not in a thriving condition; replace all other workmanship and materials which are unsatisfactory in the opinion of the Landscape Architect; make good any other damage, loss, destruction, or failure to flourish sufficiently as the result of inferior or defective materials or workmanship, including, but not limited to inadequate drainage.
3. All replacement material shall match the size attained by original materials at the time of the replacement.
4. Remove dead or dying material from the site within 5 days of notice.
5. Repair grades and other Work necessitated due to planting replacements.
6. If the replacement is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit. Replacements shall have a similar 1-year Guarantee from date of replacement.
7. Guarantee applies to losses or damage other than those due to vandalism, Owner neglect, or Acts of Nature, as determined by the Owner, Architect, and Landscape Architect. Acts of Nature is defined as, but may not be limited to, high winds of hurricane or tornado force, sleet, hail, freezing rain, and extreme cold (as determined by the Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at fifteen percent (15%) less than original contract price for the damaged work.

D. The guarantees and warranties in this Section 02900 shall be in addition to, shall be in effect simultaneously with, and shall not alter other project or product warranties or guarantees, nor shall they serve as a limitation to other remedies available to the Owner.

3.4 FINAL INSPECTION AND ACCEPTANCE:

A. Contractor is responsible for contacting the Landscape Architect at the end of the Guarantee Period to schedule final inspection. Should the Contractor fail to contact the Landscape Architect at this time, the Guarantee Period is automatically extended until he does so.

B. At the end of the Guarantee Period, submit request for inspection for Final Acceptance to Landscape Architect at least 1-week prior to anticipated date of inspection; include list of Work substantially accepted and list of Work replaced during Guarantee Period.

C. Upon request for inspection, jointly review with Landscape Architect all guaranteed Work for Final Acceptance.

D. Remove tree staking apparatus and saucers from all trees, unless otherwise directed; replace mulch to specified thickness.

E. Upon completion by the Contractor of all required repairs and replacements, the Landscape Architect will confirm the date of Final Acceptance of the Work.

END OF LANDSCAPE WORK

SECTION 03310

CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 02200 - "Earthwork"
2. Section 02520 - "Portland Cement Concrete Paving"
3. Section 02668 - "Water Service Piping"
4. Section 02720 - "Storm Drainage"
5. Section 07900 - "Joint Sealers"
6. Division 15 - "Mechanical Work"
7. Division 16 - "Electrical Work"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes concrete work.

B. "Mud Seals" (if any): As shown on Structural Drawings (if any), and as indicated in Division 2 Section "Earthwork", of lean 2,500 psi (minimum) concrete placed in the bottom of footing and foundation trenches and excavations, is required.

1. Mud seals shall be completely clean prior to placement of any reinforcing and/or permanent or structural concrete.

1.3 REFERENCED STANDARDS

A. Codes and Standards: ACI 301 "Specifications for Structural Concrete Buildings"; ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provisions except as otherwise indicated.

1.4 QUALITY ASSURANCE

A. Concrete Testing Service: All laboratory and field testing required to insure compliance with these specifications shall be performed by a qualified independent testing laboratory. Contractor shall be responsible for design of concrete mix.

1. Refer to Section 01015 - "Special Conditions" for additional information and requirements.

B. Certificates, signed by concrete producer and Contractor, will not be acceptable in lieu of material testing service reports.

C. Quality Control:

1. Sampling and testing shall be performed by the Testing Service for quality control during placement of concrete, and shall include the following, for each design strength of concrete.

2. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

3. Slump: ASTM C 143; one test for each concrete load at point of discharge, and one test for each set of compressive strength test specimens. Slump test shall be made with standard 12" high, frustrum of a cone, metal container with open ends.

4. Air Content: ASTM C 231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

5. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, and when 80 degrees F. and above; and each time a set of compression test specimens is made.

6. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

7. Compressive Strength Tests:

   a. ASTM C 39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 4,000 sq. ft. of surface area placed; 1 specimens tested at 7 days, 2 specimens tested at 28 days, and 1 specimens retained in reserve for later testing, if the required 28 day strength is not met. Otherwise, the cylinder may be destroyed.

   b. If 28 day strength is not met, test one of two remaining cylinders at 56 days.

   c. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

D. Test results shall be reported in writing to Architect, Structural Engineer, Owner and Contractor on same day tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break of both 7-day tests and 28-day tests. Include daily log of concrete operations.

E. Additional Tests: The testing service shall make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

1.5 SUBMITTALS

A. Manufacturer's Data: Submit manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials and others as requested by Architect.

B. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs.

C. Mix Proportions and Design:

1. Proportion mixes complying with mix design procedures specified in ACI 301.

2. Submit written report to Architect for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Architect.

3. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Architect.

4. Use Air-entraining admixture in all concrete, providing not less than 4% and more than 8% entrained air for all concrete.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Concrete Materials: Portland Cement:

1. ASTM C 150, type as required.

2. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to Architect and Structural Engineer.

3. Water: Potable.

4. Air-Entraining Admixture: ASTM C 260.

5. Water-Reducing Admixture: ASTM C 494; type as required to suit project conditions. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable.

6. Calcium chloride or admixtures containing chloride ions are not permitted.

B. Vapor Retarders/Barriers: Provide vapor retarder/barrier 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. Vapor Barrier, **General Use** (except as otherwise indicated below):

a. Provide equivalent to one of the following:

1) Product/Manufacturer: "Moistop Underslab", standard thickness of ± 14-mils, as manufactured by Fortifiber Building Products Systems; Reno, NV; Including in part, joint tape, mastic and/or seals, and all other components required for a complete, proper, and vaporproof installation.

2) Product/Manufacturer: Stego Wrap 10-mil, Class A, as manufactured by Stego Industries, LLC; San Juan Capistrano, CA; Including in part, Stego Tape, joint mastic and/or seals, and all other components required for a complete, proper, and vaporproof installation.

b. Locations for Use: Continuous below all building slabs, and other structural slabs, porches, stoops, pads, covered (below roofs) areas, etc., on grade, and turned-down to tops of footings.

2. Vapor Barrier, **Below and 5'-0" beyond any new Fluid-Applied Sports Flooring, Wood Flooring, Linoleum Flooring, Carpet with Vapor Barrier Backing,** and as otherwise indicated: Premolded seven-ply membrane consisting of reinforced core and carrier sheet with fortified bitumen layers, protective weathercoating, and plastic anti-stick sheet. Provide manufacturer's recommended mastics and gusset tape, and all other components required for a complete, proper, and vaporproof installation.

a. Product/Manufacturer: Subject to compliance with requirements, provide "Premoulded Membrane Vapor Seal with Plasmatic Core," as manufactured by W.R. Meadows, Inc.; Austell, GA.

b. Locations for Use: Continuous below and 5'-0" beyond all new "Fluid-Applied Sports Flooring", wood and linoleum flooring, and carpet with vapor barrier backing.

C. Related Materials: (**Note:** Omit curing compounds and hardeners at any "fluid-applied sports flooring").

1. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

2. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal. Equivalent to "Sealtight CS-309" acrylic curing and sealing compound, as manufactured by W.R. Meadows, Inc.

3. Sealer for General Use and For Exposed Interior Concrete Floors: ASTM C 309, Type 1, Class B, USDA accepted, VOC compliant; Equivalent to "Sealtight Vocomp-25" water-emulsion acrylic curing and sealing compound, as manufactured by W.R. Meadows, Inc.

4. Coordinate the use (or non-use) of membrane-forming compounds with the suppliers of finishes to be provided on concrete surfaces. Do not use membrane-forming compounds at locations where they may have a detrimental effect on the permanent installation of the finish materials, floor coverings, their adhesives, setting beds, etc. At such locations, utilize only dissipating type compounds.

5. Joint Fillers and Sealants: Refer to Section 07900 - "Joint Sealers."

D. Form Materials:

1. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

2. Use flexible spring steel forms or laminated boards to form radius bends as required.

3. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

4. Exposed Concrete Surfaces: Provide material to suit project conditions.

E. Reinforcing Materials:

1. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

2. Welded Wire Fabric: ASTM A 185; 6 x 6 W1.4/W1.4, unless indicated otherwise.

2.2 PROPORTIONING AND DESIGN OF MIXES:

A. Compressive Strength: 3,000 psi at 28 days, minimum, unless otherwise indicated.

B. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. All Concrete: W/C 0.53

C. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, Slabs, and Sloping Surfaces: Not less than 3 inches or more than 5 inches.

2. Reinforced Foundation Systems: Not less than 3 inches and not more than 5 inches.

3. Other Concrete: Not more than 5 inches, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Job Site Mixing: Not permitted.

B. Ready-Mix Concrete: ASTM C 94.

C. Formwork:

1. Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position.

2. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.

3. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during concrete placement if required to eliminate mortar leaks.

D. Reinforcements:

1. Position, support and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers, hangers and/or new concrete brick (not clay brick), as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

2. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.

3. All reinforcing shall be observed by the Architect before concrete is placed. Such observation shall not relieve the Contractor of his responsibility for correctness and compliance with contract documents.

E. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair strength and appearance of structure. Place isolation and control joints in slabs-on-grade to stabilize differential settlement and random cracking.

F. Installation of Embedded Items: 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 diagrams, templates and instructions provided by others for locating and setting.

G. Concrete Placement:

1. Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

2. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.

3. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement and curing.

a. In cold weather comply with ACI 306.

b. In hot weather comply with ACI 305.

H. Concrete Finishes:

1. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4" height rubbed down or chipped off.

    a. Provide grout rubbed finish at exposed building slab and loading dock edges, so as to provide a fine sand textured and consistent even finish and coloration.

2. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds.

3. Trowel Finish: Apply trowel finish to monolithic slab surfaces that are exposed to view or are to be covered with resilient flooring, paint, or other thin film coating. Consolidate concrete surfaces by finish troweling, free of trowel marks, uniform in texture and appearance.

4. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete walkways, platforms, steps and ramps, and elsewhere as indicated.

I. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections are required to prevent damage to exposed concrete surfaces.

3.2 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 of exposed 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. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location for reinforcing steel during concrete placement.

3.3 CONCRETE FOUNDATIONS FOR EQUIPMENT

A. The concrete pads required by mechanical and electrical equipment shall be included under this section of the specifications. See mechanical and electrical sections of the specifications, and mechanical and electrical drawings for size, design and location of equipment requiring concrete pads and foundations. Concrete shall be of same type as specified for floor slabs and shall have a smooth integral finish prior to applying broom finish. Set bolts, anchors, piping, etc., in concrete as required by manufacturer of equipment used. Templates or setting diagrams as necessary will be furnished by the various trades and equipment manufacturer. Provide turned-down perimeter footings, and steel reinforcing in footings and foundations as indicated.

END OF CONCRETE

SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 05500 - "Metal Fabrications"
2. Section 06100 - "Rough Carpentry"
3. Section 07600 - "Flashing and Sheet Metal"
4. Section 07900 - "Joint Sealers"
5. Section 09900 - "Painting"

1.2 SUMMARY:

A. The extent of each type of masonry work is indicated on the Drawings and Schedules.

1. All CMU shall extend up to bottom of structure, unless specifically indicated otherwise.

2. A continuous reinforced and concrete filled CMU bond beam and a full-width P.T. 2 x wood plate shall occur at top of all CMU walls, unless specifically indicated otherwise.

3. Provide bullnose CMU at all outside corners of walls; Except first CMU at bottom of wall and at ceiling shall be square corner units so as to accommodate base and ceiling materials.

B. This Section includes the following:

1. Concrete masonry units (CMU) and decorative masonry units (Split-Face), where indicated on the Drawings.

2. Standard gray colored mortar at exposed interior and concealed exterior locations.

3. Mortar color and tooling at exposed exterior locations as indicated, selected by Architect.

4. Anchors, ties, reinforcing, masonry accessories, and concealed flashings, and galvanized steel lintels.

a. Special interlocking flashings below parapet caps and all other tops of walls exposed at the exterior of buildings, and other locations where occurs on site.

b. Elastic through-wall flashing at all wall base flashing, at heads and sills of exterior wall openings, at flashing at perimeters of all exterior wall openings, and as otherwise indicated.

5. Masonry Insulation, at locations specified:

   a. Rigid board insulation (exterior walls' air space).

   b. Foamed-in-place insulation (all interior and exterior hollow CMU); and as otherwise indicated.

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Provide concrete unit masonry that develops at least the following installed compressive strengths (f'm): f'm = 1,500 psi.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Manufacturer's product data for each different masonry unit, accessory, water repellent (integral and surface-applied types), and other manufactured product indicated, including certifications that each item and type complies with specified requirements.

   a. Include instructions for handling, storage, installation, and protection.

2. Shop drawings for reinforcing, if any, detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

3. Samples for initial selection purposes of the following, and for verification after initial selections (4 sets minimum):

   a. Colored masonry mortar samples showing colors available, in price range of preselected mortar color.

   b. Exposed Masonry, showing full extent of colors and variations anticipated, for each standard and special shape unit selected, and as indicated on the Drawings.

1.5 QUALITY ASSURANCE:

A. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

D. Subcontractors: Subcontractors shall have been established in their own firms for at least 5 verifiable years and shall have successfully completed at least 5 verifiable projects of this size, scope, and complexity. Furnish names and telephone numbers of General Contractors for each project submitted for consideration of experience requirements.

1. Refer to Section 01015 - "Special Conditions" for additional information and requirements.

E. Field-Constructed Mock-Ups for Each Different Brick and Mortar Required: Prior to installation of unit masonry, erect sample wall panels to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:

1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect.

2. Build mock-ups for the following types of masonry in sizes of approximately 4 feet long by 4 feet high by full thickness, including face and backup wythes as well as accessories.

a. Each type of exposed unit masonry construction, utilizing mortar color and joint detail selected and/or specified, insulation, flashing, and weeps.
b. Incorporate integral and applied water repellents, the same as required for the completed work.
c. Provide a 4'-0" long by 3'4" high sample wall with all three brick colors matching wall pattern.

3. Notify Architect one week in advance of the dates and times when mock-ups will be erected.

4. Protect mock-ups from the elements with weather-resistant membrane.

5. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit masonry construction.

a. When directed, demolish and remove mock-ups from Project site.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units off the ground, 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 place until units are in an air-dried condition.

C. Store cementitious materials and insulation off the ground, under cover, and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

F. Refer to Section 01010 - "Summary of Work" and Section 01015 - "Special Conditions", for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Protection of Masonry:

1. 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.

2. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

3. Where one wythe of multi-wythe 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:

1. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed, painted, and/or to receive any other coatings. Remove immediately any grout, mortar, and soil that come in contact with such masonry.

2. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface, until landscaping or other improvements indicated adjacent to completed masonry work are in place.

3. Protect sills, ledges, and projections from mortar droppings.

4. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings, coatings, water repellents, and/or any other damage.

D. Clean Air Space:

1. Prevent grout and mortar from occurring in, bridging, forming ledges, and/or filling air space between masonry and back-up walls.

2. Remove excess grout and mortar flush with back side of masonry as work progresses, using trowel, board pulled up through air space, or other effective and acceptable method(s), pre-approved by Architect.

3. Provide cavity drainage material specified just above through-wall flashings and weeps.

E. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:

1. Do not lay masonry units that are wet or frozen.

2. Remove masonry damaged by freezing conditions.

F. Hot-Weather Construction: Comply with referenced unit masonry standard, or applicable Building Code requirements.

G. Thoroughly clean and rinse all masonry prior to application of water repellents, water-proofing, coatings, paint, etc. Comply with written recommendations of each manufacturer of products to be applied to masonry work.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.2 CONCRETE MASONRY UNITS:

A. General:

1. Comply with requirements indicated below applicable to each form of concrete masonry unit required.

2. Provide special shapes where indicated and as follows:

a. For lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

b. Provide bullnose CMU at all outside corners of walls; Except first CMU at bottom of wall and at ceiling shall be square corner units so as to accommodate base and ceiling materials.

3. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.

4. Concrete Masonry Units:

a. Manufacturer’s standard sixteen (16) inches long x eight (8) inches x eight (8) inches nominal dimension, unless indicated otherwise on Drawings.

b. Provide 1/4 notched foundation block and other preformed shapes, if any, as indicated on the Drawings.

5. Concrete Building Brick: Standard Modular, 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

6. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

B. Hollow Load-Bearing Concrete Masonry Units - (CMU):

1. ASTM C 90, Grade N.

2. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1,900 psi.

3. Weight Classification: Lightweight, at above-grade locations.

4. Weight Classification: Normal weight, at below-grade locations, and where necessary to achieve required fire-ratings according to manufacturer's testing and/or by "calculated fire resistance" as may be allowed by applicable building code.

C. Concrete Building Brick:

1. ASTM C 55, Grade N.

2. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 3,500 psi.

2. Weight Classification: Lightweight.

D. Decorative Concrete Masonry Units: UBC Standard 21-4.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.

2. Weight Classification: Medium weight or Normal weight.

3. Size (Width): 3-5/8".

4. Pattern and Texture: Standard pattern, split-face finish.

5. Colors: Grey.

2.3 MORTAR AND GROUT MATERIALS:

A. Portland Cement for Grout: 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 required mortar color.

B. Masonry Cement:

1. ASTM C 91.

2. For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected by Architect after bidding, within Allowance amount(s).

C. Sand: ASTM C 144.

D. Hydrated Lime: ASTM C 207, Type S.

E. Aggregate for Mortar:

1. ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.

2. White Mortar Aggregates: Natural white sand or ground white stone, only where necessary to achieve selected colors.

F. Aggregate for Grout: ASTM C 404.

G. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

H. Water: Clean and potable.

2.4 REINFORCING STEEL:

A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.

B. Steel Reinforcing Bars: Billet steel complying with ASTM A 615, and Section 03310 - "Concrete".

2.5 JOINT REINFORCEMENT:

A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standards and this article, formed from the following:

1. Galvanized carbon steel wire, coating class as required by referenced unit masonry standard for application indicated, complying with ASTM A 82, hot-dipped galvanized after fabrication to comply with ASTM A 153, class B-2 coating (1.5 ounces per square foot).

B. Description: For multi-wythe masonry, provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet in widths approximately 2 inches less than nominal width of walls and partitions, as required for full mortar embedment and mortar coverage of not less than 5/8 inch at exterior sides and not less than 1/2-inch elsewhere; with prefabricated corner and tee units, and complying with requirements indicated below, unless otherwise indicated:

1. Wire Diameter for Side Rods: 0.1483 inch (9 gauge).

2. Wire Diameter for Cross Rods: 0.1483 inch (9 gauge).

3. Type as follows:

a. Truss design with diagonal cross rods spaced not more than 16 inches o.c. and number of side rods as follows:

b. Number of Side Rods for Multi-wythe Masonry: One side rod for each face of masonry units more than 4 inches in nominal width plus one side rod for each wythe of masonry 4 inches or less in nominal width.

C. Manufacturers: Subject to compliance with requirements, provide joint reinforcement by one of the following:

1. Dur-O-Wal, Inc.
2. Heckman Building Products, Inc.
3. Hohmann & Barnard, Inc.
4. Masonry Reinforcing Corp. of America.
5. Southern Construction Products, Inc.

2.6 TIES AND ANCHORS, GENERAL:

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standards and of this article.

B. Galvanized Carbon Steel Wire:

1. ASTM A 82, coating class as required by the Standard Building Code and referenced unit masonry standard for application indicated.

2. Wire Diameter: 0.1875 inch.

C. Galvanized Steel Sheet as follows: ASTM A 366 (commercial quality) cold-rolled carbon steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, Class B2 (for unit lengths over 15 inches) and Class B3 (for unit lengths under 15 inches), for sheet metal ties and anchors exposed to the weather and not completely embedded in mortar and grout.

D. Thickness of Steel Sheet Galvanized After Fabrication: Uncoated thickness of steel sheet hot-dip galvanized after fabrication:

1. 0.0598 inch (16 gage).

E. Steel Plates and Bars: ASTM A 36, hot-dip galvanized to comply with ASTM A 123 or ASTM A 153, Class B3, as applicable to size and form indicated.

F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AA Wire Products Co.
2. Dur-O-Wal, Inc.
3. Heckman Building Products, Inc.
4. Hohmann & Barnard, Inc.
5. Masonry Reinforcing Corp. of America.

6. National Wire Products Industries.
7. Southern Construction Products, Inc.

2.7 ADJUSTABLE ANCHORS, CONNECTING MASONRY TO STRUCTURAL FRAMEWORK:

A. General: Two-piece assemblies as described below allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it.

B. For anchorage to new concrete, provide manufacturer's standard with dovetail anchor section formed from sheet metal and triangular-shaped wire tie section sized to extend within 1-inch of masonry face and 16-inches o.c. vertically and 16-inches o.c. horizontally (minimum).

C. For anchorage to steel framework provide manufacturer's standard anchors with crimped 1/4-inch-diameter wire anchor section for welding to steel and triangular-shaped wire tie section sized to extend within 1-inch of masonry face and 16-inches o.c. vertical (minimum):

1. Wire Diameter: 0.1875 inch.

2.8 RIGID ANCHORS AT LOCATIONS INDICATED OR REQUIRED:

A. Provide straps of form and length indicated, or required (if any), fabricated from metal strips 1-1/2-inches wide by 1/4-inch thick.

2.9 ADJUSTABLE MASONRY VENEER ANCHORS FOR CONNECTING MASONRY TO WOOD OR METAL STUDS AT SINGLE-WYTHE WALLS, AND WHERE THRU-WALL JOINT REINFORCING CANNOT BE USED:

A. General: Provide 2-piece galvanized assemblies where required (if any), allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it; for attachment over sheathing to metal studs or masonry back-up and with the following structural performance characteristics:

1. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in either tension or compression without deforming over, or developing play in excess of, 0.05-inch.

B. Screw-Attached (to studs) and Expansion Anchor Attached (to masonry back-up) Masonry Veneer Anchors:

1. Units consisting of wire tie section and metal anchor section complying with the following requirements:

a. Wire Tie Shape: Z-shaped pintle (single or double).

b. Wire Tie Length: As required to extend 2-1/2-inches into masonry wythe of veneer face.

2. Anchor Section: 16-gauge sheet metal plate (at single-leg or double-leg pintle), or similar wire eye-configuration (at double-leg pintle), with plate type pre-punched for screw hole(s) at top and outward legs bent to form leg to bridge insulation and abut studs, or masonry; of overall size as required for intended application.

C. Steel Drill Screws for Steel Studs or Masonry: ASTM C 954 except manufactured with hex washer head and neoprene washer, #10 diameter by length required to penetrate steel stud flange by not less than 3-exposed threads, and masonry but not less than 1-inch, and with corrosion protective coating; as recommended by manufacturer for the intended use.

D. Galvanize all components.

2.10 MISCELLANEOUS ANCHORS AT LOCATIONS INDICATED OR AS REQUIRED BY PROJECT CONDITIONS:

A. Unit Type Masonry Inserts in New Concrete: Cast iron or malleable iron inserts of type and size indicated.

B. Dovetail Slots for New Concrete: Furnish dovetail slots, with filler strips, of slot size indicated, or if not indicated, as required by project conditions, fabricated from 0.0336-inch (22-gage) galvanized sheet metal.

C. Anchor Bolts: Steel bolts complying with A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations, as indicated on the Drawings, or if not indicated, as required for the intended use:

1. Headed bolts.

2. Nonheaded bolts, straight.

3. Nonheaded bolts, bent in manner indicated.

2.11 POST-INSTALLED ANCHORS, WHERE INDICATED OR AS REQUIRED:

A. Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Type: Expansion anchors.

2. Material: Zinc-plated carbon steel, hot-dipped galvanized after fabrication, or Zamac, or other non-corrosive or coated material in compliance with requirements and submitted for prior approval.

3. For post-installed anchors in grouted concrete masonry units: Capability to sustain, without failure, a load equal to 6-times loads imposed by masonry.

2.12 EMBEDDED FLASHING MATERIALS:

A. Vinyl Sheet Flashing (typical except below parapet caps and all other tops of walls exposed at the exterior of buildings and other locations on site):

1. Smooth surfaced flexible sheet flashings especially formulated from virgin polyvinyl chloride with plasticizers and other modifiers, to remain flexible and waterproof in concealed masonry applications, black in color and of thickness indicated below:

a. Thickness: 30-mils.

2. Product/Manufacturer: "Nervastral 300" (smooth surface both sides, not textured, grained, etc.), or pre-approved equivalent submitted at least 10-days prior to original Bid Date and subsequently approved, including mastic, and where required companion surface conditioner product, and all other materials and components required.

3. Application: Use where flashing is fully concealed in masonry, including in part, wall flashing, below sills, at lintels, above grade weeps at base of exterior walls, etc.

4. Adhesive for Flashings: Type recommended by manufacturer of flashing material, for each use indicated.

B. Interlocking Metal Flashing (typical below parapet caps and all other tops of walls exposed at the exterior of buildings and other locations on site):

1. Low-profile concealed through-wall sheet metal flashing, fabricated with ribs at 3-inch intervals along length of material, to provide an integral bond with solid mortar bedding at each side.

2. Height: 3/8-inch.

3. Width: 1-inch less than wall thickness (set in-place 1/2-inch back from each exterior wall face).

4. Material: ASTM A 167, Type 302/304, 2d finish, fully annealed or dead soft temper stainless steel, 0.018-inch thickness.

5. Product/Manufacturer: Provide one of the following, or pre-approved equivalent product, properly submitted (refer to Section 01015 - "Special Conditions") at least 10-days prior to original bid dated and subsequently accepted by addendum or letter by Architect.

a. "Dovetail Design Flashing"; Cheney Flashing Co.; 1-800-322-2873.

b. "Three-Way Interlocking Flashing"; Keystone Flashing Co.; 1-800-526-8348.

c. "Interlocking Mechanically-Keyed Flashing"; Mastercraft Metals, Inc.; 1-888-593-3572.

2.13 MISCELLANEOUS MASONRY ACCESSORIES:

A. Nonmetallic Expansion Joint Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from the following material:

1. Flexible Cellular Neoprene.

B. Preformed Control Joint Gaskets:

1. Material as indicated below, designed to fit project conditions, and to maintain lateral stability in masonry wall; size and configuration as indicated, or if not indicated, T-shape (or other special shapes required by project conditions to fit inside masonry, and of depth through joint to allow proper sealant application with only one backer rod.

2. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation 2AA-805.

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: Cotton sash cord; 3/8-inch outside diameter by length(s) as required to overlap cord 2-inches past adjacent weep hole at bottom of air space at interior wall cavity, extend through exterior wythe(s), and 4-inches on exterior side - until water repellent is applied and excess is trimmed flush with raked mortar joint at flashing.

1. Wet cord prior to embedding in mortar.

2.14 MASONRY CLEANERS:

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

2.15 MORTAR AND GROUT MIXES:

A. General:

1. Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

2. 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:

1. Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless indicated otherwise.

2. Use Type M mortar for masonry below grade and in contact with earth, and where indicated.

3. Use Type S mortar for reinforced masonry and where indicated.

4. Use Type S mortar for exterior, above-grade load-bearing and non-loadbearing walls and parapet walls; for interior load-bearing walls; for interior non-loadbearing partitions, and for other applications where another type is not indicated.

D. Mortar Colors:

1. Standard gray colored mortar at exposed interior and concealed locations.

2. Colored mortar at exposed exterior locations shall match existing.

E. Grout for Unit Masonry:

1. Comply with ASTM C 476 for grout for use in construction of reinforced and nonreinforced 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.

2. Use fine grout in grout spaces less than two inches (2") in horizontal direction, unless otherwise indicated.

3. Use coarse grout in grout spaces two inches (2") or more in least horizontal dimension, unless otherwise indicated.

2.16 INSULATION FOR COMPOSITE MASONRY WALLS:

A. Provide the insulation products below at all interior and exterior CMU masonry walls, except where cells are required to be filled with grout or concrete.

1. Foamed-in-place Foam Insulation System - Pre-approved Equivalent To:

a. "Core Foam Masonry Foam Insulation", as manufactured by cfiFOAM, Inc.; Knoxville, TN; Phone: 1-800-656-3626; or

b. "Core-Fill 500", as manufactured by Tailored Chemical Products, Inc.; Hickory, N.C.; Phone: 1-800-627-1687; or

c. "R501", as manufactured by PolyMaster, Inc.; Knoxville, TN.; Phone: 1-800-580-3626 (Representative: Southeast Construction Services, LLC; Dothan, AL.; Phone: (334) 673-0622).

2. Where foam insulation may occur at exterior and other double-wythe walls, install from cavity side, and conceal drilled holes at all locations where possible.

3. Holes for installation of foam insulation shall occur in and be no larger than typical 3/8-inch mortar joints. Patches for holes shall be for the full depth of mortar removed by drilling, and shall match adjacent mortar joint tooling and texture.

B. Rigid Insulation Board: Provide one of the following:

1. Extruded Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5-year aged r-values of 5.4 and 5 at 40 and 75 deg F (4.4 and 23.9 deg C), respectively; and as follows:

a. Type IV, 1.6 pcf min. density, unless otherwise indicated.

b. Product/Manufacturer: Styrofoam "Square Edge" or "Score Board", as manufactured by Dow Chemical Co., or approved equivalent, with joint closure/sealer accessories.

c. Provide 1-1/2 inch thickness at any air space of exterior composite masonry walls and in air spaces of other exterior building walls, unless other thickness is indicated on the Drawings.

2. Polyisocyanurate Board Insulation: Aluminum-foil-faced, glass-fiber-reinforced, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C 1289, Type I, Class 2.

a. Product/Manufacturer: "Thermax", as manufactured by Dow Chemical Co., or approved equivalent, with joint closure/sealer accessories.

b. Provide 1-1/2 inch thickness at any air space of exterior composite masonry walls and in air spaces of other exterior building walls, unless other thickness is indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry, if any.

B. Examine rough-in and built-in construction to verify actual locations of other or related work, prior to installation.

C. Do not proceed until any unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL:

A. Comply with referenced unit masonry standards and other requirements indicated, applicable to each type of installation included in Project.

1. Install bought-out manufactured items (i.e.: flashing, special flashing, insulation, etc.), in accordance with manufacturer's current written directions and recommendations, related fire tests/certifications, and reviewed shop drawings.

B. Thickness: Build cavity and composite walls and other masonry construction to the full thickness indicated. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

C. Height: Build walls and other masonry construction to full height indicated, or if not indicated, at least up to bottom of structure or structure bearing height where occurs. Extend fire-rated

walls, and all perimeter/surrounding walls at the following rooms up to bottom of structure or roof deck, as required to seal-off top of walls:

1. Toilet and Janitor's Rooms (including chase walls).
2. Storage Rooms.
3. Mechanical, Electrical and Utility Rooms.
4. Laundry Rooms.
5. Kitchens, and rooms where food is stored, prepared, cooked and/or served.

D. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

E. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

F. 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.

1. Use dry cutting saws to cut concrete masonry units.

G. Do not wet concrete masonry units.

H. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

I. Fill all hollow masonry and air spaces below grade with concrete.

J. Provide solid substrate for all wall flashing.

K. Wet sash cord weeps prior to embedding in mortar, so it will not draw water out of mortar.

3.3 CONSTRUCTION TOLERANCES - REQUIRED FOR ACCEPTANCE:

A. Comply with construction tolerances of referenced unit masonry standards.

B. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4-inches in 10-feet, or 3/8-inches in a story height not to exceed 20-feet, nor 1/2-inches in 40-feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4-inch in any story or 20-feet maximum, or 1/2-inch in 40-feet or more. For vertical alignment of head joints do not exceed plus or minus 1/4-inches in 10-feet, 1/2-inch maximum.

C. 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 any bay or 20-feet maximum, nor 1/2-inch in 40' or more. For top surface of bearing walls do not exceed 1/8-inches between adjacent floor elements in 10' or 1/16" within width of a single unit.

D. 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 any bay or 20' maximum, nor 3/4" in 40' or more.

E. Variation in Cross Sectional Dimensions: Do not exceed bed joint thickness indicated by more than plus or minus 1/8". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.4 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 up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less that nominal 4-inch horizontal face dimensions at corners or jambs.

1. Exterior Concrete Masonry Units: Running bond, unless specifically indicated otherwise on Drawings.

2. All interior CMU shall be running bond, unless specifically indicated otherwise on Drawings.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. 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 in each course; do not tooth. Clean exposed surfaces of set masonry, wet masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work:

1. As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

2. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

3. 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.

4. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING:

A. Lay hollow concrete masonry units as follows:

1. **With full mortar coverage on horizontal and vertical face shells and cross webs.**

2. Bed all webs in mortar in starting course on footings and in all courses of walls, piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

B. Cut joints flush for masonry walls to be concealed or to be covered by base, crown moulding, and/or other materials, unless otherwise indicated.

C. Tool all joints in exposed work as follows:

1. Interior: Slightly concave, with a tool of at least 50% but no more than 100% larger than joint width.

2. Exterior: Slightly concave, with a tool of at least 50% but no more than 100% larger than joint width.

3. Cut flush with face of exposed masonry, and taking care not to spread mortar over onto face of masonry units.

D. Maintain joint widths of 3/8 inch, except for minor variations required to maintain bond alignment, or as otherwise required to align with or match adjacent work.

E. Collar Joints: After each course is laid, fill vertical longitudinal joint between wythes solidly with mortar, for the following work:

1. Exterior walls, except where clear air space above flashing is indicated.

2. Interior bearing walls.

3.6 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY:

A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes, at 16 inches o.c. vertically (maximum) at running bond and 8 inches o.c. (maximum) at any stacked bond.

B. Corners:

1. Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

2. Provide continuity with horizontal joint reinforcement at corners using prefabricated “L” units, in addition to masonry bonding.

C. Intersecting and Abutting Walls:

1. Unless vertical expansion or control joints are shown or necessary at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:

2. Provide individual metal ties to columns and stud walls, at 16 inches o.c. vertically (maximum).

    a. Provide additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0" o.c.

3. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.

4. Provide continuous dovetail slots, with anchors at 16 inches o.c. maximum vertically and 16 inches o.c., at new concrete back-up walls, columns, etc.

3.7 MASONRY WALL CELL INSULATION:

A. Fill foamed-in-place insulation in cavities as indicated, to completely fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each area. Close ports after complete coverage has been confirmed. Limit fall of insulation to one story in height, but not to exceed 8'-0".

1. Provide foamed-in-place insulation at the following locations:

    a. In cells of all hollow CMU indicated in Paragraph 2.3 above, except cells which are required to be filled with concrete or grout.

3.8 CAVITIES/AIR SPACES:

A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush.

1. Where not possible and at wood and metal studs, tie exterior wythe to backup with individual metal ties spaced not more than 16 inches o.c. vertically and 16" o.c. horizontally. Stagger alternate courses.

B. Provide weepholes in exterior wythe of new cavity walls, located immediately above ledges and flashing, spaced 32 inches o.c. unless otherwise indicated.

C. Tie exterior wythe to backup and multi-wythe walls with continuous horizontal joint reinforcing at 16 inches o.c. vertically.

D. Install continuous rigid insulation as the work progresses, in compliance with manufacturer's current written recommendations, including in part, adhesives for securing to substrate, and joint fillers, sealers, or other treatments

1. Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. 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.

2. Fill cracks and open gaps in insulation with crack sealer and cover with tape after cured; both acceptable to sealer and insulation manufacturer.

3.9 HORIZONTAL JOINT REINFORCEMENT (FOR MULTI-WYTHE WALLS):

A. General: Provide continuous horizontal joint reinforcement as indicated and as required by Code, but not more than 16 inches o.c. vertically at running bond and 8 inches o.c. vertically at any stacked bond. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 1/2-inch elsewhere. Lap reinforcing a minimum of 6 inches.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by use of 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.

D. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2-0" beyond jambs of the opening except at control joints.

3.10 ANCHORING MASONRY WORK:

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.

2. Anchor masonry to structural members with flexible anchors which allow 4-way movement embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally.

B. Anchor single-wythe masonry veneer to studs with masonry veneer anchors to comply with the following requirements:

1. Fasten each anchor section through sheathing to studs with 2 metal fasteners of type indicated.

2. Embed tie section in masonry joints. Provide not less than 1-inch air space between back of masonry veneer wythe and face of sheathing.

3. Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.

4. Space anchors as indicated but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0" o.c.

3.11 CONTROL AND EXPANSION JOINTS:

A. General: Install control and expansion joints in unit masonry where existing in floor slabs, walls, and roof, and as otherwise 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 masonry as follows: Install preformed control joint gaskets designed to fit wall construction. Fill recesses with backer rod and flexible sealant, as specified in Section 07900 - "Joint Sealers." Use firestop materials at fire-rated walls, as specified in Section 07270 - "Firestopping."

C. Provide control joints at locations indicated or as approved by Architect, and not to exceed the following at continuous straight runs:

1. Exterior walls: 30'-0" o.c. maximum.

2. Interior walls: 40'-0" o.c. maximum.

3.12 LINTELS:

A. Install hot-dipped galvanized steel lintels where exterior steel lintels are indicated.

B. Provide masonry or precast lintels where shown and wherever openings of more than 1'-0" for brick size units are shown without structural steel or other supporting lintels. Temporarily support formed-in-place lintels, including steel lintels, for at least 7-days after masonry above has been completed; Supports shall be from cured concrete or masonry construction (at least 8-days old) or other surface accepted in writing by Architect, prior to installing supports.

1. For hollow concrete masonry unit walls, use specially formed bond beam units with reinforcement bars placed as indicated and filled with course grout.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

1. Unless indicated otherwise, fill all jamb cells with concrete, from supporting structure below, up to bottom of lintel bearing, 8-inches wide by CMU wall thickness - minimum.

3.13 FLASHING/WEEP HOLES:

A. General: Install embedded concealed flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in exterior walls, and where indicated.

B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing. Place flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive/sealant/tape, as recommended by flashing manufacturer before covering with mortar.

1. Where indicated or required by manufacturer, provide continuous seal at top edge, using their recommended materials.

C. Install flashings as follows:

1. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at exterior end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches on back-up wall (at stud walls), and seal top edge with product specified; except turned up a minimum of 8 inches at back-up masonry walls and extended through back-up wall to within 1/2-inch of its interior face.

2. At heads and sills, extend flashing as specified above unless otherwise indicated but turn up ends not less than 2 inches to form a pan.

3. Cut off flashing 1/2-inch from exterior face of wall and tool joint in accordance with flashing manufacturer's requirements.

4. Comply with manufacturer's current written instructions and recommendations.

D. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.

E. Install weep holes, in the head joints in exterior wythes of the first course of masonry immediately above embedded flashings and as follows:

1. Form weep holes with product specified in Part 2 of this Section.

2. Space weep holes 32 inches o.c., except 24 inches o.c. at heads and sills of masonry openings, and centered on openings, unless specifically indicated otherwise on the Drawings.

3. Wet cotton sash cord prior to embedding in mortar.

F. Place cavity drainage material immediately above flashing in cavities.

3.14 INSTALLATION OF REINFORCED UNIT MASONRY:

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standards, and as indicated on the Drawings.

3.15 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 and in fresh mortar or grout, pointed to eliminate evidence of replacement.

1. Clean glass, unit masonry and other surfaces as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass, unit masonry or other surfaces.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. 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 1/2- panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised", to clean brick masonry made of clay or shale, except use detergent as the masonry cleaner.

6. Clean concrete masonry by means of cleaning method indicated in NCMA TEK 45 applicable to type of stain present on exposed surfaces.

a. Comply with masonry manufacturer's instructions.

3.16 PROTECTIONS:

A. Trim excess sash cord flush with cured mortar joint at exterior side of walls.

B. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF UNIT MASONRY

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 03310 - "Concrete"
2. Section 04200 - "Unit Masonry"
5. Section 05500 - "Metal Fabrications"
6. Section 06100 - "Rough Carpentry"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes structural steel work. Structural steel is that work defined in AISC "Code of Standard Practice" and otherwise shown on drawings.

1.3 QUALITY ASSURANCE:

A. Codes and Standards:

1. Comply with provisions of following, except as otherwise indicated:

a. AISC "Code of Standard Practice for Steel Buildings and Bridges."

b. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings".

c. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", including the "Commentary" and Supplements thereto as issued.

d. AISC "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

e. AWS D1.1 "Structural Welding Code".

f. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures". Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12 months. If recertification of welders is required, retesting will be Contractor's responsibility.

1.4 SUBMITTALS:

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint.

4. Shrinkage-resistant grout.

B. Shop Drawings: Submit shop drawings prepared under supervision of a registered professional engineer, 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 standards AWS symbols, and show size, length, and type of each weld.

2. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorages to be installed by others.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay that work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller

marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Shapes, Plates and Bars: ASTM A 36, except where other type steel is indicated.

1. W and WT Shapes: ASTM A992, Grade 50, unless otherwise indicated on Structural Drawings.

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B.

D. Hot-Formed Steel Tubing: ASTM A 501, Grade B.

E. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Finish: Black, except where indicated to be galvanized.

F. Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.

G. Anchor Bolts: ASTM A 307, non-headed type unless otherwise indicated.

H. High-Strength Threaded Fasteners:

1. Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

a. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

2. Direct tension indicator washers may be used at Contractor’s option.

I. Electrodes for Welding: Comply with AWS Code.

J. Structural Steel Primer Paint: Southern Coatings “Heavy Duty RIP Primer 1-0900”, Tnemec “10-99 Primer”, or preapproved equivalent.

1. Verify that primer is 100% and fully compatible with any sprayed-on fire-proofing product intended for use. Notify Architect immediately in writing of any related problems.

K. Non-Metallic Shrinkage-Resistant Grout:

1. Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-621.

2. Products offered by manufacturer to comply with requirements for non-metallic, non-shrink grout include the following:

a. Euco N.S.; Euclid Chemical Company
b. Crystex; L & M Construction Chemicals.
c. Masterflow 713; Master Builders.

d. Five Star Grout; U.S. Grout Corp.
e. Upcon; Upco Chemical Division, USM Corp.
f. Propak; Protex Industries, Inc.

2.2 FABRICATION:

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specification and as indicated on final shop drawings. Provide camber in structural members where indicated.

2. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

3. Where finishing is required, complete assembly, including welding of units, before start of finish operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Connections:

1. Weld or bolt shop connections, as indicated.

2. Bolt field connections, except where welded connections or other connections are indicated. Use high-strength threaded fasteners.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" (RCRBSJ).

D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

E. 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.

1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

2. 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:

1. Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

2. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

3. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning", followed by SP-3 "Power Tool Cleaning".

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform dry film thickness of 2.5 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until satisfactory conditions have been corrected in a manner acceptable to the Erector.

3.2 ERECTION:

A. Surveys: Employ a registered professional engineer or land surveyor, experienced in survey work, to establish permanent bench marks as shown and as necessary 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. Anchor Bolts:

1. Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

2. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate location.

3. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

E. Setting Bases and Bearing Plates:

1. 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.

2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

3. 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.

4. Pack grout solidly between bearing surfaces and bases of plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

F. Field Assembly:

1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

2. Level and plumb individual members of structure within specified AISC tolerances.

3. Splice members only where indicated and accepted on shop drawings.

G. Erection Bolts:

1. On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

2. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

I. Touch-Up Painting:

1. Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Apply paint to exposed areas with same material as used for shop painting.

2. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.3 FIELD QUALITY CONTROL:

A. An independent testing and inspection agency shall inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. Refer to Section 01015 - "Special Conditions" for additional information and requirements.

1. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

2. Contractor shall 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.

3. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

4. Contractor shall correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Additional tests as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work will be performed at Contractor's expense.

B. Shop Bolted Connections: Inspect in accordance with AISC specifications.

C. Shop Welding:

1. Inspect during fabrication of structural steel assemblies, as follows:

2. Certify welders and conduct inspections as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

3. Perform visual inspection of all welds.

D. Field Bolted Connections: Inspect in accordance with AISC specifications.

E. Field Welding:

1. Inspect during erection of structural steel as follows:

2. Certify welders and conduct inspections as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

3. Perform visual inspection of all welds after welding, and again after cleaning and re-priming.

END OF STRUCTURAL STEEL

SECTION 05210

STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 03310 - "Concrete"
2. Section 04200 - "Unit Masonry"
3. Section 05120 - "Structural Steel"
4. Section 05310 - "Steel Deck"
5. Section 05500 - "Metal Fabrications"
6. Section 09900 - "Painting"

1.2 SUMMARY:

A. This Section includes steel joists for floor and/or roof framing. Types of joists required include the following, and as otherwise indicated on the Drawings:

1. K-Series Open Web Steel Joists.
2. LH-Series Open Web Steel Joists.

B. Refer to Division 3 Sections for installation of anchors set in concrete.

C. Special Requirement: All exposed steel shall be factory prime-coated, light gray color, 1 coat minimum.

D. Finish painting of all exposed steel is specified in Division 9 Section "Painting", not the work of this Section.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data and installation instructions for each type of joist and accessories.

a. Include manufacturer's certification that joists comply with SJI "Specifications."

2. Shop drawings showing layout of joist members, special connections, joining and accessories. Include mark, number, type, location and spacing of joists and bridging.

a. Provide templates or location drawings for installation of anchor bolts and metal bearing plates.

b. Include manufacturer's Structural Engineer's certification of compliance with requirements via affixing their current Alabama Registration Seal to the Design Data and Shop Drawings submitted.

3. Current certification for all field welding personnel.

1.4 QUALITY ASSURANCE:

A. General: Provide joists fabricated in compliance with Steel Joist Institute (SJI) "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

1. Fabricator shall have been in business of steel joist fabrication for at least five verifiable years, with a successful record of providing joists of types indicated for ten or more projects.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society (AWS) "Structural Welding Code - Steel," AWS D1.1.

1. Refer to Division 1 Section "Special Conditions" for personnel experience and additional quality control requirements.
2. Welding operators/welders shall have current certification for the types of work required.

C. Inspection: Inspect joists and girders in accordance with SJI "Specifications."

1.5 DELIVERY, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Deliver, store and handle steel joists as recommended in SJI "Specifications." Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

1. Store steel joists on wood supports, off of ground or paving.
2. If stored on ground, cover ground with 6-mil. polyethylene vapor barrier and secure in place 5'-0" beyond stored joists, and otherwise required to prevent mud or other foreign matter from splashing or otherwise getting on them.

C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel: Comply with SJI "Specifications" for chord and web sections.

B. Steel Bearing Plates: ASTM A 36.

C. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.

D. Steel Primer Paint: Comply with SJI "Specifications.

1. Southern Coatings "Heavy Duty RIP Primer 1-0900", Tnemec "10-99 Primer", or preapproved equivalent.
2. Color: Light gray; 1 coat minimum.

E. Bedding Mortar: For joist ends bearing on concrete or masonry, provide bedding mortar as follows:

1. Non-metallic shrinkage-resistant mortar; pre-mixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

a. Products: Provide non-metallic, shrinkage-resistant mortar as manufactured by one of the following:

1) Euco N.S.; Euclid Chemical Co.
2) Crystex; L&M Construction Chemicals
3) Masterflow 713; Master Builders
4) Five Star Grout; U.S. Grout Corp.
5) Upcon; Upco Chem. Div., USM Corp.
6) Propak; Protex Industries, Inc.

2.2 FABRICATION:

A. General: Fabricate steel joists in accordance with SJI "Specifications."

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.

C. Extended End: Provide extended ends on joists where indicated, complying with SJI "Specifications" and load tables.

D. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord and all other areas. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1-inch of finished wall surface, unless otherwise indicated.

E. Top Chord Extension: Provide top chord extensions ("R" type) on joists where indicated, complying with SJI "Specifications" and load tables.

F. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI "Specifications."

1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

G. End Anchorage: Provide end anchorages, including steel bearing plates, to secure joists to adjacent construction, complying with SJI "Specifications."

H. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

I. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.

1. Painting: Immediately after surface cleaning and preparation, apply structural steel primer paint in accordance with manufacturer's printed instructions and at a rate to provide a uniform dry film thickness of at least 2.5 mils. Stripe paint corners, crevices, bolts, welds, and sharp edges, using painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION:

A. Place and secure steel joists in accordance with SJI "Specifications," final shop drawings, and as herein specified.

B. Anchors: Furnish anchor bolts, steel bearing plates, and other devices to be built into concrete and masonry construction.

1. Provide unfinished threaded fasteners for anchor bolts, unless high strength bolts indicated.

C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

1. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
2. Where "open-web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

D. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

E. Fastening Joists: Comply with the following:

1. Field weld joists to supporting steel framework and steel bearing plates where indicated in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
2. Secure joists resting on masonry or concrete bearing surfaces by bedding in mortar and anchoring to masonry or concrete construction as specified in SJI "Specifications" for type of steel joist used.

F. Touch-Up Painting: After joist installation, wire brush welded areas, abraded or rusty surfaces, and clean with solvent. Paint field-applied bolt heads and nuts and prepared surfaces on joists and steel supporting members. Use same type of paint as used for shop painting.

END OF STEEL JOISTS

SECTION 05310

STEEL DECK

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, at locations indicated on the Drawings:

1. Roof deck, galvanized (if any).
2. Noncomposite form deck, galvanized.
3. Composite deck, galvanized.
4. Other types, if so indicated on the Drawings (if any).
5. **NOTE**: Any deck exposed in the finished work shall be factory prefinished baked enamel prime painted, in standard color to be selected by Architect after bidding; Available "standard" colors shall include in part, white and black.

B. Related Sections include the following:

1. Division 3 Section "Concrete" for concrete fill and reinforcing steel.
2. Division 5 Section "Structural Steel" and Division 13 Section "Pre-Engineered Metal Building Systems" for supporting structure.
3. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
4. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
5. Division 9 Section "Painting" for repair painting of any painted deck.

C. Finish painting of all exposed steel is specified in Division 9 Section "Painting", not the work of this Section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: For each type of deck, accessory, and product indicated.

C. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

D. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products.

G. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck 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.

1. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."

D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

E. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings - AND AS OTHERWISE INDICATED ON STRUCTURAL DRAWINGS AND AS REQUIRED BY FM GLOBAL AND FM "ROOFNAV" APPROVALS / ASSEMBLIES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's current written instructions and recommendations.

B. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

C. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

D. Refer to Division 1 Sections "Summary of Work" and "Special Conditions", for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Galvanized Steel Deck:

a. BHP Steel Building Products USA Inc.
b. Consolidated Systems, Inc.
c. Epic Metals Corp.
d. Marlyn Steel Products, Inc.
e. Nucor Corp.; Vulcraft Div.
f. Roof Deck, Inc.
g. United Steel Deck, Inc.
h. Verco Manufacturing Co.
i. Vulcraft Division; Nucor Corporation.
j. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK

A. 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. 29, as indicated on the Drawings, and the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating, unless otherwise indicated on Structural Drawings.
2. Deck Profile: Type B, wide rib, unless otherwise indicated on Structural Drawings.
3. Profile Depth: 1-1/2 inches (38 mm).
4. Design Uncoated-Steel Thickness: 20-gauge, and as otherwise indicated on Structural Drawings.
5. Span Condition: As indicated.
6. Side Laps: Overlapped seams at Contractor's option.

2.3 NONCOMPOSITE FORM DECK

A. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating, unless heavier grade and/or zinc coating is otherwise indicated on Structural Drawings.
2. Profile Depth: As indicated on Structural Drawings.
3. Design Uncoated-Steel Thickness: 26-gauge, unless otherwise indicated on Structural Drawings.
4. Span Condition: As indicated.
5. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.4 COMPOSITE FLOOR DECK - AND COMPOSITE ROOF DECK WHERE INDICATED

A. Composite Steel Floor Deck (and any Composite Roof Deck Where Indicated): Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1 Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating, unless heavier grade and/or zinc coating is otherwise indicated on Structural Drawings.
2 Profile Depth: 3-inches, unless indicated otherwise on Structural Drawings.
3 Design Uncoated-Steel Thickness: 20-gauge, unless otherwise indicated on Structural Drawings.
4 Span Condition: Triple span or more, or as indicated.
5. Side Laps: Overlapped or interlocking seam, as indicated on Structural Drawings.

2.5 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 (4.8 mm) minimum diameter.

C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile indicated, or if not indicated, recommended by SDI Publication No. 29 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch (1.52 mm) at form deck, and 0.0747 inch (1.90 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter, unless otherwise indicated on Structural Drawings.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level or sloped recessed pans, as indicated or otherwise required by project conditions, of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

J. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

K. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, 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 decking 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 decking.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, 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.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches (38 mm) long, and as follows, unless otherwise indicated on Structural Drawings:

1. Weld Diameter: 5/8-inch, nominal, unless otherwise indicated on Structural Drawings, or required to comply with applicable codes and standards, and wind-uplift resistance requirements.
2. Weld Spacing: Unless otherwise indicated on Structural Drawings or otherwise required by code, weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of the roof and 6 inches (150 mm) apart in roof corners and perimeter, based on roof-area definitions of FM Loss Prevention Data Sheet 1-28, unless otherwise indicated on Structural Drawings, or required to comply with applicable codes and standards, and wind-uplift resistance requirements.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches (910 mm), and as follows, unless otherwise indicated on Structural Drawings:

1. Mechanically fasten with self-drilling self-tapping No. 10 diameter (No. 12 at supports) or larger carbon-steel screws. Use 5/8-inch diameter puddle welds in lieu of screws at bar joists.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows, unless otherwise indicated on Structural Drawings:

1. End Joints: Lapped 2 inches (51 mm) minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least 1 weld at each corner.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows, unless otherwise indicated on Structural Drawings:

1. Weld Diameter: 3/4 inch (19 mm) nominal, unless otherwise indicated on Structural Drawings, or larger diameter is required to comply with applicable codes, standards, and load requirements.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart, unless otherwise indicated on Structural Drawings, or larger diameter is required to comply with applicable codes, standards, and load requirements.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 2 of the span or 36 inches (910 mm), and as follows, unless otherwise indicated on Structural Drawings.

1. Mechanically fasten with self-drilling No. 10 diameter (No. 12 at supports) or larger carbon-steel screws, or with a minimum of 1-1/2-inch-long welds, as indicated.

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:

a. Composite Deck: Lapped, unless otherwise indicated on Structural Drawings.
b. Non-Composite Deck: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing: The Owner will engage a qualified independent testing agency to perform field quality-control testing.

1. Refer to Division 1 Section "Special Conditions" for additional information and requirements regarding testing.

B. Field welds will be subject to inspection.

C. Testing agency will report test results promptly and in writing to Contractor, Structural Engineer, and Architect, but no more than five days after any individual testing requirements have been performed.

D. Remove and replace work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 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.

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of deck immediately after installation, and apply repair paint.

B. Clean, prepare and repair factory paint finish to match original finish, color and appearance, using same product as originally applied.

C. Replace any damaged insulation and any insulation that has been wet in acoustical deck, with same product and color as originally factory installed insulation.

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF STEEL DECK

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 05310 - "Steel Deck"
2. Section 05500 - "Metal Fabrications"
3. Section 06100 - "Rough Carpentry"
4. Section 07210 - "Building Insulation"
5. Section 09250 - "Gypsum Drywall" (interior and non-load-bearing studs and framing, gypsum sheathing, etc.)

1.2 DESCRIPTION OF WORK:

A. Work described in this Section includes galvanized steel stud framing systems, and any heavy-gauge steel joists and steel rafters indicated, and for use at any new exterior metal stud walls and framing, interior and exterior load-bearing walls, and other locations as indicated on drawings.

1. Studs and runner tracks at exterior walls, and any interior load-bearing walls (if any) shall size indicated on the Drawings (i.e.: 6", 8", 10", 12", depth, etc.) x 1-5/8-inches width x gauge indicated on the Drawings but no less than 18-gauge, and spaced at sixteen inches (16") o.c., unless a heavier gauge is otherwise indicated on the Drawings; with continuous bridging channels and/or stud tracks as bridging channels, as indicated, continuous deflection tracks, and framed structural headers at all openings. Special track at any curved or radiused walls and arched openings.
2. Joists and rafters (if any) and their stringers (at ends over bearing locations), bridging, and web stiffeners shall be as indicated herein, unless indicated otherwise on the Drawings; joists shall be spaced sixteen (16) inches o.c., directly over bearing studs or immediately adjacent to studs where anchored to sides of stud walls, unless otherwise indicated or accepted in writing by Architect.
3. Typical stud and joist sections shall be C-shape, and at least 1-5/8-inches width.
4. Galvanized steel strap bracing shall be provided, continuous at top and bottom runner tracks and at bridging locations at all curved stud walls.
5. Structural channels, studs, and joists, and other framing shall be as indicated on the Structural Drawings.
6. Concealed plywood sheathing and 15 lb. felt covering required at all exterior inside and outside building corners (8-feet wide x full wall height) and at parapet walls is specified in Division 6 Section "Rough Carpentry", unless larger width is indicated on Structural Drawings.

1.3 QUALITY ASSURANCE:

A. Component Design: Calculate structural properties of studs and joists in accordance with the more stringent requirements of the American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members", and their co-sponsored publication "Prescriptive Method for Residential Cold-Formed Steel Framing".

B. Design any roof trusses according to AISI's "Design Guide for Cold-Formed Steel Trusses."

C. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

D. Fire Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those that have been approved by governing authorities that have jurisdiction.

E. Pre-Installation Conference: Prior to start of installation of metal framing systems, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data and installation instructions for each item of cold-formed metal framing and accessories.

C. Shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.

1. Include placing drawings for joists, ceiling, roof related, and supplemental and/or related framing system members showing size and gauge designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.
2. Include detailed design drawings for roof trusses and framing system, including size and gauge designations, locations, assemblies, bearing, anchorage, etc. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.
3. Include detailed design drawings for headers, including size and gauge designations, locations, assemblies, bearing, anchorage, etc.
4. Shop drawings shall bear the current signed and dated Alabama seal and license number of the manufacturer's and/or fabricator's Design Engineer responsible for their design and preparation.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with breathable waterproof tarpaulins.

C. Refer to Division 1 Sections "Summary of the Work" and "Special Conditions", for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Subject to compliance with requirements, provide products of one of the following:

1. Aegis Metal Framing, LLC
2. ClarkDietrich Building Systems, LLC
3. Marino/WARE Industries, Corp.
4. SEMCO, Southeastern Metals, Div. of Gibraltar Industries
5. Southeastern Stud & Components, Inc.
6. Steel-Con; Div. of Steel Construction Systems
7. Telling Industries, LLC

2.2 METAL FRAMING:

A. System Components: With each type of metal framing and headers required, provide manufacturer's standard steel runners (tracks), blocking, bridging, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.

B. Materials and Finishes:

1. For 16-gauge and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi; ASTM A 446, A 570, or A 611.
2. For 18-gauge and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.
3. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G60 coating.

    a. Finish of installation accessories to match that of main framing components, unless otherwise indicated.

C. "C"-Shape Studs: Manufacturer's standard load-bearing steel studs of size, shape, and gauge indicated, with 1.625-inch flange and flange return lip; or if not indicated, no less than 18-gauge.

D. Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, unpunched unless otherwise indicated, of size, shape and gauge indicated, with 1-5/16-inch flange.

1. Deflection Track - Typical at Stud Walls Extending Up To Slab or Similar Fixed Structure at Top of Walls: Provide for no less than 1" of vertical movement, Equivalent to one of the following:

    a. Dietrich Double Track System
    b. Dietrich Track-Over-Track System
    c. Dietrich SLP-TRK slotted track system
    d. Dietrich TR-Series with Spazzer 9200 Bar (SPZD)

2. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK; Phone: (405) 996-5343.
3. Special stud tracks for all arched openings and walls shall be equivalent to "Flex-C Arch" galvanized flexible segmented track with slidable straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK; Phone: (405) 996-5343.

E. Stud Wall Bridging: 1-1/2-inches x 16-gauge Cold Rolled Channel, unless otherwise indicated, anchored to each stud with 16-gauge clip angles, or welded connections (where allowed by manufacturer), and 16-gauge splice plates, with spacing at 4'-0" or 4'-6" o.c. vertically, through pre-punched slots in studs.

F. Solid Joist Bridging: 1-5/8-inches x same gauge and depth as joists, unless otherwise indicated, anchored to joists webs with 2-inch x 2-inch x 16-gauge clip angles, or welded (where allowed by manufacturer) with continuous rows spaced at mid-span minimum, or 5'-0" o.c. maximum at clear span where span exceeds 10'-0".

G. Fasteners: Provide self-drilling, self-tapping #10 sheet metal screws and bolts; threaded studs and expansion shields as required for framing.

H. Electrodes for Welding: Comply with AWS Code.

I. Galvanizing Repair Paint: High zinc dust content paint for repair of galvanized surfaces damaged by welding, complying with M.I. Specification MIL-P-21035.

J. Strap Bracing: 1-1/2-inches x 20-gauge galvanized steel, anchored at ends, splices, and each stud with typical framing screws. Placement at curved walls shall align with radius or curve indicated at each such location.

2.3 FABRICATION:

A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.

B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.

C. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer. Wire tying of framing components is not permitted.

1. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

D. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8-inch in 10 feet, and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8-inch (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).

E. Headers: Form from at least two equal size C-shapes in a back-to-back or box type configuration.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL:

A. Manufacturer's Instructions: Install metal framing system in accordance with manufacturer's current printed or written instructions and recommendations, unless otherwise indicated.

B. Runner Tracks:

1. Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks at all walls anchored to concrete floor and roof structure with threaded studs in expansion shields spaced 18-inches o.c., unless otherwise indicated.
2. Track shall be spliced with channel insert fastened with two (2) sheet metal screws, bolts or rivets at each side, each flange, each corner. Provide fasteners at corners and ends of tracks.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners and bridging to supporting structure.

E. Install supplemental framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

F. Erection Tolerances: Bolt or weld panels (at both horizontal and vertical junctures) to produce flush, even, true to line joints.

1. Step in face and jog in alignment between panels not to exceed 1/16-inch.

3.2 INSTALLATION OF WALL STUD SYSTEM:

A. Secure studs to top and bottom runner tracks at spacing indicated by either welding or screw fastening with four 3/8-inch Type S-12 pan-head screws at both inside and outside flanges.

B. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than two (2) are either shown or indicated in manufacturer's written instructions. Install cripple studs below and king studs and jack studs on each side/end of headers, minimum same size and gauge as wall studs where occurs, and anchor together securely. Install runner tracks and jack studs above and below headers at wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated. Attach structural sheathing to each component.

C. Install horizontal bridging in all walls, and the additional strap bracing at curved walls as steel framing progresses. Install at spacing indicated and in compliance with stud manufacturer's written recommendations.

D. Frame both sides of expansion and control joints, with separate studs; do not bridge the joint with components of stud system.

3.3 INSTALLATION OF JOISTS AND RAFTERS:

A. Install joists level, straight, and plumb, and rafters likewise except at slope indicated, complete with bracing and reinforcing as indicated on drawings, or otherwise specified and/or required by project conditions.

B. Provide not less than 1-1/2-inches end bearings.

C. Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by joist manufacturer.

D. Reinforce joists at interior supports with single short length of joist section located directly over interior support, snap-on shoe, 30 percent side-piece lapped reinforcement, or other method recommended by joist manufacturer.

E. Secure joists to interior support systems to prevent lateral movement of bottom flange.

F. Provide continuous row(s) of solid internal bridging where indicated, required, and/or recommended by joist manufacturer, using the material indicated, or if not indicated, the same material as joists. Anchor securely to each joist web or flange with clip angles or welding, as specified herein.

3.4 FIELD QUALITY CONTROL:

A. Testing: All field quality-control testing shall be performed by a qualified independent testing agency. Refer to Division 1 Section "Special Conditions" for additional information and requirements.

1. Field and shop welds will be subject to inspection and testing.
2. Testing agency will report test results promptly and in writing to Contractor and Architect.

3. Remove and replace Work that does not comply with specified requirements.
4. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.5 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. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

C. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF COLD-FORMED METAL FRAMING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Division 3 - "Concrete"
2. Section 04200 - "Unit Masonry"
3. Section 06100 - "Rough Carpentry"
4. Section 09900 - "Painting"
5. Section 13122 - "Pre-Engineered Metal Building Systems"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes metal fabrications, which include items made from iron and steel or aluminum shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere. Types of work in this section includes metal fabrications for:

1. Rough hardware.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Miscellaneous framing and supports.
5. Ladders with safety cages where indicated and where required by the more stringent of applicable codes and standards, at elevator pit, any roof hatches and elsewhere ladders are indicated.

1.3 QUALITY ASSURANCE:

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 PERFORMANCE REQUIREMENTS:

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and

other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

C. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others. Where materials or fabrications are indicated to comply with certain requirements for design loadings include structural computations, material properties and other information needed for structural analysis.

1. Show fabrication and installation details. In addition to applicable requirements above, include plans, elevations, sections, and details of connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

D. Samples: Submit representative samples of materials and finished products as may be requested by Architect.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Where fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting acceptable to fabricator's professional engineer, and in a manner that will not affect structural performance, deflection, safety, etc.

1.7 COORDINATION:

A. Coordinate installation of anchorages for metal fabrications and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation, without delaying the work of this section or the Work of the project.

1.8 DELIVERY, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Protect metal fabrications from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, type and location for installation. Store off ground in a dry ventilated space or protect with breathable waterproof tarpaulins.

C. Refer to Division 1 Sections "Summary of the Work" and "Special Conditions", for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

B. Ferrous Metals:

1. Steel Plates, Shapes and Bars: ASTM A 36.
2. Steel Bar Grating: ASTM A 569 or ASTM A 36.
3. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.
4. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.
5. Galvanized Structural Sheet Steel: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
6. Steel Pipe: ASTM A 53; Type and grade (If applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
7. Gray Iron Castings: ASTM A 48, Class 30.
8. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
9. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
10. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

C. Non-Ferrous Metals:

1. Aluminum Drawn Seamless Tube: ASTM B 483, 6063-T832.
2. Aluminum Castings: ASTM B 26, 356.0-T6.
3. Aluminum Plate and Sheet: ASTM B 209, 6061-T6.

D. Grout: Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE-CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

E. Fasteners:

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
2. Anchors at exterior walls, and preservative pressure treated (P.T.) and fire-retardant treated wood shall be hot-dip galvanized steel or Type 304 stainless steel.

F. Paint:

1. Metal Primer Paint: Southern Coatings "Heavy Duty RIP Primer 1-0900", Tnemec A10-99 Primer", or approved equivalent; Color: Light gray; 2 coats minimum.
2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 09900 - "Painting".
3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with Military Specifications MIL-P-21035 (Ships), or SSPC-Paint-20.
4. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL:

A. Workmanship:

1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in finished product. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
3. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown, or if not shown, Phillips flat-head (countersunk) screws or bolts.
5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
7. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

B. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars, and strip 1/8-inch thick and heavier.
3. ASTM A 386 for galvanizing assembled steel products.

C. Shop Painting:

1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
2. Stripe paint all edges, corners, crevices, bolts, welds and sharp edges.

D. Surface Preparation:

1. Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specification and environmental exposure conditions of installed metal fabrications, except where otherwise recommended in current written instructions and recommendations of paint manufacturer for the substrates to be painted:

a. Exterior (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
b. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."

2.3 ROUGH HARDWARE:

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

B. Fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.4 LOOSE BEARING AND LEVELING PLATES:

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.5 LOOSE STEEL LINTELS:

A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8-inches bearing at each side of openings, unless otherwise shown.

1. Galvanize all loose steel lintels in exterior walls.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS:

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

B. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise shown, space anchors 24-inches o.c. and provide minimum anchor units of 1-1/4-inches wide x 1/4-inch x 8-inch long steel straps.

D. Galvanize exterior miscellaneous frames and supports.

2.7 LADDERS - GENERAL:

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated.

1. Comply with requirements of ANSI A14.3, unless otherwise indicated.
2. For any elevator pit ladders, comply with ASME A17.1.
3. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c., with welded or bolted brackets, made from same metal as ladder.

2.8 STEEL LADDERS:

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3, unless otherwise indicated.

B. Siderails: Continuous, steel, 1/2 by 2-1/2-inch (12-mm by 64-mm) flat bars, with eased edges, spaced 18 inches (460 mm) apart, unless otherwise indicated.

C. Bar Rungs: 3/4-inch (19-mm) diameter steel bars, spaced 12 inches (300 mm) o.c., unless otherwise indicated.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet (1.5 m) o.c. with welded or bolted steel brackets.

1. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches (180 mm).
2. Extend side rails 42 inches (1.1 m) above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, gooseneck the extended rails back to the structure to provide secure ladder access.

F. Provide nonslip surfaces on top of each rung, either by coating the rung with aluminum-oxide granules set in epoxy-resin adhesive, or by using a type of manufactured rung that is filled with aluminum-oxide grout.

G. Galvanize ladders, including brackets and fasteners at exterior locations.

H. Finishes: Shop applied prime paint, 2 coats, for all components. Refer to Section 09900 – "Painting", for finish painting, not the work of this Section 05500.

1. All anchors, anchorage components, etc., shall be hot-dipped galvanized steel.

I. Provide ladder safety cages at locations where indicated, and at locations where required by the more stringent of applicable codes, regulations and standards.

2.9 LADDER SAFETY CAGES:

A. Where indicated and where required by the more stringent of applicable codes, regulations and standards.

1. Standards:

a. ANSI A14.3
b. OSHA regulations.

2. Comply with the more stringent and more current editions of codes and standards stated herein, as well as current adopted International Building Code and requirements of authorities having jurisdiction.

B. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet (6 m) o.c. Provide secondary intermediate hoops spaced not more than 48 inches (1200 mm) o.c. between primary hoops.
3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners, unless otherwise indicated.

C. Steel Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch (6.4-by-100-mm) flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch (6.4-by-50-mm) flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch (4.8-by-38-mm) flat bars secured to each hoop.
4. Galvanize exterior ladder cages and interior ladder cages, where ladder cages are indicated and otherwise required, including fasteners.
5. Prime exterior ladder cages and interior ladder cages, where ladder cages are indicated and otherwise required, including fasteners, with zinc-rich primer.
6. Finish painting is specified in Division 9 Section “Painting”, not the work of this Section.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete insets, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION:

A. General:

1. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.
3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip-galvanized after fabrication, and are intended for bolted or screwed field connections.

B. Field Welding: Comply with AWS Code for procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work.

C. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout. Use non-metallic, non-shrink grout.
3. Pack grout solidly between bearing surfaces and plates to insure that no voids remain.

3.3 ADJUST AND CLEAN:

A. Touch up Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same materials as used for shop painting.
2. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanized repair paint to comply with ASTM A 780.

END OF METAL FABRICATIONS

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 04200 - "Unit Masonry"
3. Section 09900 - "Painting"

1.2 SUMMARY:

A. This Section includes the following, at locations indicated on the Drawings or otherwise required by project conditions:

1. Framing with dimension lumber (if any).
2. Framing with engineered wood products (if any).
3. Wood grounds, nailers, and blocking; Preservative pressure treated when in association with roofing and other exterior work.
4. Roof and Wall Sheathing (plywood, if any).
5. Subfloor sheathing (plywood), at concealed locations (if any).
6. Framing anchors and miscellaneous accessories.

1.3 DEFINITIONS:

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for the following products, as applicable to the work of this project:

1. Air infiltration barrier.
2. Metal framing anchors (if any).
3. Plywood sheathing (if any).
4. Construction adhesives.
5. Engineered wood products (if any).

C. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

D. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:

1. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For water-borne treated products include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. Warranty of chemical treatment manufacturer for each type of treatment.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for Project.

1. Engineered wood products.
2. Air infiltration barriers.
3. Metal framing anchors.

F. Additional information as needed to clarify materials, installation requirements, etc., upon request by the Architect or Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL:

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies and Standards: Inspection agencies and standards and the abbreviations used to reference them with lumber grades and species include the following:

1. AFPA - American Forest and Paper Association (formerly NFPA)
2. AITC - American Institute of Timber Construction
3. AWPA - American Wood Preservers Association
4. AWPB - American Wood Preservers Bureau
5. NLGA - National Lumber Grades Authority (Canadian).
6. SPIB - Southern Pine Inspection Bureau.
7. WCLIB - West Coast Lumber Inspection Bureau.
8. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece; or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER:

A. For light framing provide "Stud," or "Standard" grade lumber for stud framing (2 to 4 inches thick, 2 to 4 inches wide, 10 feet and shorter) and "Standard" grade for other light framing (2 to 4 inches thick, 2 to 6 inches wide), and as follows:

1. Southern Yellow Pine graded under SPIB rules, No 2 or better.

B. For structural light framing (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species:

1. "No. 2" grade, Stress Rated, with the following minimum properties:

a. Fb = 1,150 psi.
b. E = 1,500,000 psi.

2. Species: Southern yellow pine or approved equivalent.

C. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species:

1. Same as indicated above for structural light framing.

2.3 BOARDS:

A. Concealed Boards: Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY or KD-19) and of following species and grade:

1. Southern Pine No. 2 boards per SPIB rules, or any species graded construction boards per WCLIB, or WWPA rules.

2.4 MISCELLANEOUS LUMBER:

A. General: Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

2.5 CONSTRUCTION PANELS, GENERAL:

A. Construction Panel Standards: Comply with DOC PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

1. Oriented Strand Board: Comply with DOC PS 2.

B. Trademark: Furnish construction panels that are each factory- marked with APA trademark evidencing compliance with grade requirements.

2.6 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS:

A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

B. Wall Sheathing (if any): OSB Plywood.

1. Exposure Durability Classification: EXTERIOR.
2. Span Rating: As required to suit stud spacing indicated.
3. Thickness: 1/2 inch (nominal), unless otherwise indicated, or as required to match thickness of any contiguous gypsum or other sheathing.

C. Roof Sheathing (if any): APA RATED SHEATHING, Veneer Core Plywood.

1. Exposure Durability Classification: EXPOSURE 1.
2. Span Rating: As required to suit rafter spacing indicated.
3. 40/20 minimum, unless otherwise indicated.
4. Thickness: 5/8 inch at sloped roofs and where required at parapet walls, unless otherwise indicated; 3/4-inch at any roofing substrates with less than 3:12 slope.

D. Subflooring/Horizontal Sheathing (on rafters - if any): APA RATED SHEATHING, Veneer Core Plywood; Tongue-and-Groove Edges.

1. Exposure Durability Classification: EXPOSURE 1.
2. Span Rating: As required to suit rafter spacing indicated.

a. 40/20 minimum, unless otherwise indicated.

3. Thickness: 3/4 inch, unless otherwise indicated.

2.7 CONSTRUCTION PANELS FOR BACKING:

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 3/4 inch.

2.8 FASTENERS:

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, in area of high relative humidity, or in contact with preservative pressure treated (P.T.) wood or fire-retardant treated wood, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 or 316 stainless steel.

B. Nails, Wire, and Brads: FS FF-N-105.

C. Power Driven Fasteners (screws): National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.9 METAL FRAMING ANCHORS:

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and

that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.

2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G90 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

1. Use galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and all other locations, and at every point of bearing. Change to Type 304 or Type 316 stainless steel when in contact with preservative pressure-treated or fire-treated wood.
2. Minimum Thickness: 18-gauge.

2.10 MISCELLANEOUS MATERIALS:

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.

B. Intermediate Supports for any Square-edge Roof Sheathing: Mill finish aluminum H-clip type supports/spacers, with flat top at roof side, internal "points" for pushing into sheathing to prevent sliding or dislodgement, of size required for sheathing thickness, and in compliance with referenced standards.

2.11 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS:

A. General: Where lumber is indicated as preservative- treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.

    a. Exception: Not required above treated bottom plate for framing which is bearing on concrete floor slab on grade.

4. Wood floor plates installed on concrete slabs or directly in contact with earth.

C. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.12 ENGINEERED WOOD PRODUCTS:

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS:

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.3 WOOD FRAMING, GENERAL:

A. Framing Standard: Comply with A.F.P.A. "Manual for Wood Frame Construction", unless otherwise indicated.

B. Install framing members of size and spacing indicated, or if not indicated, to comply with referenced standard.

C. Anchor and nail as shown, and to comply with the following:

1. Published requirements of manufacturer of metal framing anchors.
2. "Fastening Schedule," of the International Building Code.

D. Fire stop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where fire stops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

3.4 STUD FRAMING (IF ANY):

A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Install single bottom plate and double top plates using 2-inch thick members whose widths equal that of studs. Nail or anchor plates to supporting construction, as indicated and as required by applicable codes and standards, authorities having jurisdiction, and project conditions.

1. Anchor bottom plats to concrete slabs with at least 2-inch diameter galvanized anchor bolts with nuts and washers at 4'-0" o.c. (minimum) and otherwise as required by code and project conditions.
2. For exterior walls install 2-inch by 6-inch wood studs spaced 24 inches o.c., unless otherwise indicated.
3. For interior partitions and walls install 2-inch by 4-inch wood studs spaced 16 inches o.c., unless otherwise indicated.
4. The extent of wood stud framing, if any, is indicated on the Drawings.

B. Construct corners and intersections with not less than 3 studs. Install miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim.

1. Install continuous horizontal blocking row at mid-height of single-story partitions over 8 feet high and at midpoint of multi-story partitions, using 2-inch thick members of same width as wall or partitions.

C. Frame openings with multiple studs and headers. Install nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For nonbearing partitions, install double-jamb studs and headers not less than 4 inches deep for openings 3 feet and less in width, and not less than 6 inches deep for wider openings.
2. For load-bearing partitions, install double-jamb studs for openings 6 feet and less in width, and triple-jamb studs for wider openings. Install headers of depth shown, or if not shown, as recommended by A.F.P.A. "Manual for Wood Frame Construction".

D. Install diagonal bracing in stud framing of exterior walls, except as otherwise indicated. Brace both walls at each external and internal corner, full story height, at a 45 degree angle, using either a let-in 1 by 4 or 2 by 4 blocking or metal diagonal bracing. Omit bracing where following types of sheathing are indicated.

1. Plywood sheathing or corner bracing, 8-feet-wide panels, vertically, at each face of any wall framing at corners.

3.5 INSTALLATION OF CONSTRUCTION PANELS:

A. General: Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing and Wall Sheathing: Nail to wood framing; screw to metal framing.
2. Subfloor Sheathing: Glue and screw to supports.
3. Plywood Backing Panels: Nail to wood supports; toggle-bolt or expansion bolt anchors to masonry back-up; screw to metal framing.

END OF ROUGH CARPENTRY

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 04200 - "Unit Masonry" (masonry insulation)
2. Section 06100 - "Rough Carpentry"
3. Section 07411 - "Manufactured Roof Panels"
4. Section 09250 - "Gypsum Drywall"
4. Section 13133 - "Pre-Engineered Metal Building System"

1.2 SUMMARY:

A. This Section includes the following:

1. Building insulation, **formaldehyde-free**, in batt form, in any exterior stud walls, on continuous support at bottom of roof joists / trusses / purlins, at miscellaneous locations, and as otherwise required to provide a continuous and complete insulation envelope between interior and exterior of building.

2. Extend insulation up to at least the bottom of primary attic or roof insulation, at all wood and metal stud exterior walls.

3. Extend sound batts up to top of wall or up to bottom of attic insulation, at all new wood and metal stud interior walls, and within all stud walls fire-rated 2-hours or more.

4. Supports and miscellaneous accessories.

a. **Note:** Insulation shall be supported above the surface of any horizontal fire-rated gypsum board, using manufacturer's standard wires, straps, or other effective method acceptable to product manufacturers and authorities having jurisdiction. The only acceptable alternative will be assembly test data which indicates no reduction in the fire-rating of fire protection materials due to insulation being in direct contact with fire-rated assembly materials.

1.3 DEFINITIONS:

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of insulation product and accessory specified.

1.5 QUALITY ASSURANCE:

A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide **formaldehyde-free** insulation products of one of the following:

1. Manufacturers of Glass Fiber Insulation: (**formaldehyde-free**)

    a. CertainTeed Corp.
    b. Georgia-Pacific
    c. Knauf Fiber Glass GmbH.
    d. Manville Building Insulations Div., Manville Sales Corp.
    e. Ottawa Fibre, Inc.
    f. Owens/Corning Fiberglass Corp.

2.2 INSULATING MATERIALS:

A. General:

1. Provide insulating materials that comply with requirements, with referenced standards, and free of formaldehyde.

2. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

B. Unfaced Mineral Fiber Blanket/Batt Insulation (sound batts): Thermal insulation produced by combining mineral fibers of type described below with **formaldehyde-free** thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass or slag; **formaldehyde-free**.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

3. Thickness: Unfaced 3" or 3-1/2" for use in all areas shown on Drawings and where sound batts are indicated herein this Section 07210, and for in-fill of voids around windows, frames, etc., at metal and wood framing.

C. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with **formaldehyde-free** thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft membrane on one face, and as follows:

1. Mineral Fiber Type: Fibers manufactured from glass or slag; **formaldehyde-free**.

2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

3. Thickness: **Full stud depth**, generally 3-1/2 inches nominal, R-11; 6 inches nominal, R-19; and 8 inches nominal, R-25, etc., continuous at all exterior stud walls; and nominal, R-30 continuously supported at bottom of roof joists or trusses, and other locations only as indicated.

a. Refer to Division 13 Section "Pre-Engineered Metal Building Systems" for metal building insulation.

4. NOTE: Where insulation is concealed by other construction (inside walls, on or above ceiling materials, etc.), **and** in substantial contact with back of wall/ceiling facing materials, the following insulation may be used, except NOT at Mechanical plenum spaces.

a. ASTM C 665, Type II, Class C; Kraft-faced membrane on one face; **Formaldehyde-free**, and otherwise same as above.

2.3 MISCELLANEOUS MATERIALS:

A. General: Provide support system acceptable to insulation manufacturer where insulation batts are not fully concealed in wall construction, occur between open horizontal framing (i.e.: nothing else at bottom of framing if in attic), where a reduction occurs in fire protection materials fire-rating due to insulation being in direct contact with fire-rated assembly materials, etc., in addition to mechanical anchorage.

1. Products: Provide one of the following or other method acceptable to Architect; which requires the use of the default FSK type insulation above:

   a. Galvanized struts or straps, at 2'-0" o.c. maximum, anchored at each end; at walls and fire-rated horizontal construction components.

   b. Galvanized 2" mesh "chicken wire," continuous, and anchored to framing at 1'-0" o.c. maximum, at any open framing.

B. Baffles: Insulation manufacturer's standard recommended baffles at eaves, to close-off edges of insulation and to keep from extending batts into above soffit area. Provide at least 1-inch clear from roof decking to allow ventilation through attic and concealed areas from soffit vents.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL:

A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.

   1. Do not install insulation which is or has been wet, or otherwise damaged.

B. Provide support system at locations where insulation is exposed in open or partially exposed framing, or is otherwise unsupported.

C. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

   1. Omit insulation over recessed lighting fixtures.

D. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION:

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate using mechanical anchorage to provide permanent placement and support of units.

B. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.

C. Stuff glass fiber loose fill insulation into miscellaneous voids and cavity spaces. Compact to approximately 40 percent of normal maximum volume (to a density of approximately 2.5 pcf).

3.4 PROTECTION:

A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF BUILDING INSULATION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07270

FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2. DESCRIPTION OF WORK:

A. Work described in this Section includes:

1. Through penetration firestopping in fire rated construction.
2. Construction-gap firestopping at connections of the same materials and different materials in fire rated construction.
3. Construction-gap fire stopping occurring within fire rated wall, floor, floor-ceiling, and/or roof-ceiling assemblies.
4. Construction-gap firestopping at the top of fire rated walls.
5. Through-penetration smoke-stopping in smoke partitions.
6. Construction-gap smoke-stopping in smoke partitions.

B. Related work Specified elsewhere includes:

1. For structural, finish, and fire protection materials: Refer to the appropriate Specifications Sections.
2. Fire dampers and manufactured devices: Refer to Division 15.
3. Raceway seals and manufactured electrical devices: Refer to Division 16.

C. Unless specifically indicated otherwise, the party, trade, or subcontractor whose work penetrates fire-rated construction and/or fire-rated assemblies, shall be responsible for firestopping around their own penetrations.

D. In the event the General Contractor employs a Specialty Subcontractor for the required firestopping work, they shall notify all prospective Bidders, so as to avoid duplication in pricing.

1. The Specialty Subcontractor shall provide coordination of requirements and the related work of other trades in advance of and as the Work progresses.

1.3 REFERENCED STANDARDS:

A. Underwriters Laboratories - U.L. Fire Resistant Directory:

1. Through-penetration fire stop devices (XHCR).
2. Fire resistant ratings (BXUV).
3. Through-penetration firestop systems (XHEZ).
4. Fill, void, or cavity material (XHHW).

B. American Society for Testing and Materials Standards:

1. ASTM E 814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
2. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories, Inc.:

1. UL 1479: Fire Tests of Through-Penetration Firestops.
2. UL 723: Surface Burning Characteristics of Building Materials.

1.4 DEFINITIONS:

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, smoke barrier walls, time rated floor-ceiling and roof-ceiling assemblies, and structural floors and walls.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses, and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.

F. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc., to close specific barrier penetrations.

G. Sleeve: Metal fabrication or metal pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.5 SYSTEM DESCRIPTION:

A. Design Requirements:

1. Fire Rated Construction: Maintain barrier and structural floor fire ratings including resistance to cold smoke at all penetrations, connections with other surfaces and/or types of construction, at separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.
2. Smoke Barrier Construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound and/or vibration absorption, and at other construction gaps.

1.6 SUBMITTALS:

A. Submit in accordance with General Conditions, Division 1, and Section 01015 - "Special Conditions," unless specifically indicated otherwise.

B. Product Data: Manufacturer's written specifications and technical data including the following:

1. Detailed specifications of construction and fabrication.
2. Manufacturer's current written installation instructions.
3. Summary of test data for each product intended for use and limitations. Include name and address of the required independent testing laboratory and compliances obtained.

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. Details of each proposed assembly identifying intended products and applicable UL System number or UL Classified devices.
2. Manufacturer or manufacturer's representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.

D. Quality Control Submittals: Statement of qualifications.

E. Applicators' Qualifications Statement: List past projects indicating required experience.

1.7 QUALITY ASSURANCE:

A. Specialty Contractor's Qualifications: Firm experience in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, and to State, Local, and/or other authority having jurisdiction, where applicable.
2. At least 2-years experience with systems intended for use.
3. Successfully completed at least five projects of similar size, scope, and complexity using the systems intended for use.

B. Local and State Regulatory Requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System Numbers or UL classified devices and/or systems.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.8 DELIVERY, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Packing and Shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.
2. Coordinate delivery with scheduled installation date, so as to allow minimum storage at site.

C. Storage and Protection: Store materials in a clean, dry, ventilated interior location. Store materials off of floor, and protect from soiling, abuse, moisture, and freezing. Follow manufacturer's written instructions when more stringent.

D. Remove damaged and/or contaminated materials immediately, legally dispose of off site, and Replace, at Contractor's expense.

E. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.9 PROJECT CONDITIONS:

A. Existing Conditions:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding with work.
2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

B. Environmental Requirements:

1. Furnish adequate ventilation if using solvents.
2. Furnish forced air ventilation during installation if required by manufacturer and/or authorities having jurisdiction.
3. Keep Flammable materials away from sparks or flame.
4. Provide masking or drop cloths to prevent contamination of adjacent surfaces by firestopping materials.
5. Comply with manufacturer's written recommendations for temperature and humidity conditions before, during, and after installation of firestopping.

1.10 GUARANTEE:

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasive resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, and/or general durability, and/or which appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality or characteristic of the material for the exposure indicated. The guarantee period shall be for 1-year from the date of "Substantial Completion."

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS:

A. Use only those listed in the UL Fire Resistance Directory for the UL System involved.

B. Products shall be as manufactured by one of the following, or pre-approved equivalent:

1. Dow Corning.
2. HILTI.
3. 3M Fire Protection Products.
4. Nelson Firestop Products.

5. Rector Seal Corp.
6. Specified Technologies, Inc.
7. Tremco, Inc., Div. of RPM Corporation.

C. All firestopping products must be from a single manufacturer.

D. All trades shall use products from the same manufacturer.

2.2 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION:

A. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that they conform to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designated to perform this function.

2.3 CONSTRUCTION-GAP FIRESTOPPING OF FIRE-RATED CONSTRUCTION:

A. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.

B. Firestopping at construction gaps between tops of partitions and under side of structural systems.

C. Firestopping at construction gaps between tops of partitions and underside of fire-rated ceiling or ceiling assembly.

D. Firestopping of control joints in fire rated masonry partitions.

E. Firestopping expansion joints.

F. Acceptable manufacturers and products: Use only those listed in the UL Fire Resistant Directory for the UL System involved.

2.4 SMOKE STOPPING AT SMOKE PARTITIONS:

A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded, as applicable.

B. Construction-gap smoke-stopping: Any system complying with the requirement for construction-gap firestopping in fire-rated construction, as specified in the "Referenced Standards" is acceptable, provided that the system includes the specified smoke seal or will provide the smoke seal. The length of time of the fire resistance may be disregarded, as applicable.

2.5 ACCESSORIES:

A. Fill, void, and cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.

B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Notify the General Contractor of such conditions.

1. Verify barrier penetrations are properly sized and in suitable conditions for application of materials.
2. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 PREPARATION AND CLEANING:

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances, that may effect proper fitting, adhesion, or the required fire resistance.

3.3 INSTALLATION:

A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's written instructions and recommendations.

B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

C. Where floor openings without penetrating items are more than 4-inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as required for floor system.

D. Protect materials from damage on surfaces subject to traffic.

E. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges, which are to be installed in accordance with fire damper manufacturer's written recommendations, unless specifically indicated otherwise.

F. Where large openings are created in walls, or floors to permit installation of pipes, ducts, cable tray, bus duct, or other items, close unused portions of opening with firestopping material tested for the application.

G. Install smoke firestopping as specified for firestopping.

H. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12-inch wide fiber dams for full thickness and height of air cavity at maximum intervals of 15'-0" on center.

3.4 FIELD QUALITY CONTROL:

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by the Architect, building inspector, fire inspector, and/or other authority having jurisdiction.

C. Perform under this Section 07270, patching and repairing of firestopping caused by cutting or penetration by other trades, and/or by any other cause.

3.5 ADJUSTING AND CLEANING:

A. Immediately clean-up spills of liquid components.

B. Neatly cut and trim materials as required.

C. Remove equipment, materials and debris, leaving area in undamaged and clean condition.

D. Legally dispose of excess materials, trash, debris, etc., off of site.

END OF FIRESTOPPING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section includes the following, where indicated, and where required by project conditions, and which are not part of other Sections:

1. Prefinished metal counter flashing and base flashing.
2. Miscellaneous prefinished metal wall flashing, counterflashing, and reglets.
3. Exposed prefinished metal trim/fascia units, column caps, and other items as indicated on the Drawings.
4. Elastic flashing at top of all curbs, top course of double wythe walls, at perimeters of all exterior wall openings (i.e.: doors, windows, louvers, etc.), through-wall flashing, and elsewhere as indicated.
5. Miscellaneous sheet metal accessories as indicated and as required by project conditions.

B. Exposed metal flashing is intended to be factory formed, prefinished baked enamel, as specified, in manufacturer's standard non-metallic color(s) selected by Architect after bidding.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for Flashing, Sheet Metal and Accessories: Manufacturer's current technical product data, installation instructions and general recommendations for each specified sheet material, fabricated product, coating system, and color selection data.

C. Samples of the following flashing, sheet metal, and accessory items:
1. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
2. Physical samples for color selections, where color selection is required.

D. Shop drawings showing layout, profiles, methods of joining, and anchorages details, including major counterflashings, trim/fascia units, expansion joint systems, and other fabricated work. Provide layouts at 1/4-inch scale and details at 3-inch scale.

E. Provide written assurance that each sheet metal product to be incorporated into a Roofing warranty is approved by the roof system manufacturer, and also code compliant per ANSI-SPRI ES-1.

1.4 PROJECT CONDITIONS:

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 ROOFING SHEET METAL, FASCIA, GUTTERS, DOWNSPOUTS, TRIM UNITS, & FLASHING:

A. Provide sheet metal flashing compliant with IBC 1504 and ANSI-SPRI ES-1, and in compliance with 01360 manufacturer warranty certifications and warranty.

B. Fabricate of **minimum 24-gage** metal, with minimum 50,000 p.s.i. yield, with **2-coat** full strength (70-percent) Kynar 500 resin (20-year) finish. Provide one of the following base metals, to be the same base metal used for other sheet metal applications and systems:
1. ASTM A 792 aluminum-zinc allow coated steel sheet ("Galvalume"), or
2. ASTM A 653, G-90 (galvanized) zinc-coated steel sheet.
3. Typical metal flashing, except where specifically indicated otherwise.

C. Prefinished Metal Drip Edge: Brake-formed sheet metal with at least a 3-inch roof deck flange at shingles and at least 4-inch roof deck flange at any membrane roofs; 1-inch flange extension to support any shingle roofing and 1/2" raised edge at membrane roofing; with a 1-1/2-inch fascia flange with a 3/8-inch hemmed edge drip for shingles and 5/8" for membrane roofs. Furnish in lengths of at least 10 feet.

D. Prefinished Metal Flashing and 2-Inch High Diverter Strips:
1. Install diverter strips 1'-0" above low roof edge(s) of sloped roofs, at all locations over exterior doors, and over exterior mechanical units where roof edge gutters or parapet walls do not occur.

E. Finishes:
1. Finish for any exposed metal flashings, gutters, downspouts, coping systems, etc., shall be **2-coat** 70% resin "Kynar 500" coating (i.e.: primer and color coats); and note that the finish system may be a traditional liquid or powder coat, complying with AAMA 2605, with a total dry film thickness of not less than 1.6-mils, and manufacturer's standard 20-year minimum finish warranty; Manufacturer's standard primer or washcoat on back side, and inside gutters.
2. Colors: As selected by Architect after Bid Date, from manufacturer's standard non-metallic colors; Minimum 15 colors to select from, including color(s) to match similar metal panel applications on the existing or new buildings, or window framing.

2.2 LEAD FLASHING (AT PLUMBING VENT STACKS):

A. 4-pound lead sheet or PVC mesh reinforced sheet, fabricated to extend 4 inches minimum onto roof and turn down 1 inch minimum down inside vent stacks.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES:

A. Solder:

1. For use with steel or copper: Provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.
2. For use with stainless steel: Provide 60 - 40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.

B. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

C. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

D. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

E. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07900 - "Joint Sealers."

F. Paper Slip Sheet: 5-lb. rosin-sized building paper.

G. Counterflashing and Reglets: Metal units of type and profile indicated, or if not indicated, as required for the intended use, compatible with flashing indicated, noncorrosive.

H. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

I. Provide precast concrete splashblock sloped away from building, approximately 12-inches wide x 24-inches long x 2-inches thick x 3-inches high, with 3-raised edges and one "open" end turned toward building – at locations where downspouts would otherwise drain on grade.
1. Provide 1-precast concrete splashblock at each downspout which drains onto grade or paving;
2. Provide 1-preformed metal pan with corrugated bottom and properly hemmed edges (minimum 12" x 24") at each downspout which drains onto a roof below.

2.4 FABRICATED UNITS:

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
1. At horizontal or sloped metal flashings over 6-inches wide, provide custom configurations and continuous brake-metal roofing system, with continuous concealed clip anchors rated for I-90 uplift conditions, with 1-inch high standing seam Pittsburgh lock-seam joints - filled with sealant, double-folded, and corners turned down at 45-degrees.
2. Provide matching materials and finish for fascia metal covering, flashing, counterflashing and trim.

B. Seams: Fabricate nonmoving seams in sheet metal with standing seam at exposed tops and lapped side or edge seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer. Pop-rivet joints for additional strength where required and at vertical faces.

C. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS:

A. General: Except as otherwise indicated, comply with manufacturer's current written installation instructions, SMACNA "Architectural Sheet Metal Manual," and reviewed submittals and shop drawings.
1. Install manufactured, bought-out items in accordance with manufacturer's current written instructions and recommendations.
2. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

D. Install reglets to receive counterflashing in manner and by methods indicated, in a straight line and single elevation.

E. Install counterflashing in reglets, by snap-in seal arrangement for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure, or if not indicated, as recommended by referenced standards, flashing and roofing manufacturers, and otherwise as required for the intended application.

F. Nail or anchor flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

G. Flashing:
1. Comply with manufacturer's current written instructions and recommendations for installation of all systems components in all applications indicated on the Drawings, and as otherwise required by project conditions.
2. At any parapet wall and roof curbs applications, extend flashing continuous, over top of wall or curb, and turn down one inch (1") minimum on exterior side of wall and mechanically anchor in place at side of top of wall, below and concealed by continuous metal clip anchor (acting as termination bar) and metal cap flashing or coping, and down over top edge of roofing flashing material at roof side.

3.2 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
   1. After cleaning, repair and restore damaged metal and metal finishes with prefinished paint manufacturer's special air-drying touch-up paint, in manner such that touch-up is not apparent.
   2. Replace damaged flashing and sheet metal work which cannot be repaired and when finish repair and restoration is not acceptable to Architect.

B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF FLASHING AND SHEET METAL

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 03310 - "Concrete"
2. Section 04200 - "Unit Masonry"
3. Section 06200 - "Finish Carpentry"
4. Section 07900 - "Joint Sealers"
5. Division 8 - "Doors and Windows"
6. Section 09900 - "Painting"
7. Section 10200 - "Louvers and Vents"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes joint sealer systems.

1.3 SYSTEM PERFORMANCES:

A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an Installer who has successfully completed within the last three years at least 3 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.

B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

C. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

1.5 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's complete product specifications, handling/installation/curing instructions, color charts and performance tested data sheets for each product required.

1.6 DELIVER, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.

C. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

D. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40° F.
2. When joint substrates are wet due to rain, frost, condensation or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Asbestos Prohibited: Refer to Section 01015 - "Special Conditions".

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.

B. Colors: Provide color of exposed joint sealers indicated, or if not indicated, as selected by Architect from manufacturer's standard colors, to include colors to match window/storefront framing, metal panels, roofing, flashing and fabrications.

2.2 ELASTOMERIC JOINT SEALANTS:

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

B. Multi-Part Nonsag Urethane Sealant: Type M, Grade NS, Class 25, Uses NR, M, A and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems, "MasterSeal NP 2" (formerly Sonneborn "Sonolastic NP2")
    b. Pecora Corp., "Dynatrol II"
    c. Sika Corporation, "Sikaflex 2CNS"
    d. Tremco, Inc., "Dymeric 240FC"

2. Locations for Use: Exterior joints and penetrations in vertical surfaces of concrete, and between metal and concrete, mortar of stone; overhead or ceiling joints; perimeters of metal frames in exterior walls; vertical expansion and control joints in masonry and concrete; and at all miscellaneous locations requiring a joint sealant.
3. Equivalent 1-part sealants will be acceptable for interior surfaces only, by one of the above named manufacturers.
4. Where used in conjunction with stucco or EIFS, provide 1-part non-yellowing aliphatic polyurethane, equivalent to one of the following:

    a. BASF Building Systems, "MasterSeal CR 195" (formerly Sonneborn "Ultra")
    b. Pecora Corp., "Dynatrol I-XL Tru-White"

C. Two-Part Pourable Urethane Sealant: Type M, Grade P, Class 25; Uses T, M, A and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems, "MasterSeal SL 2 "(formerly Sonneborn "Sonolastic SL2");
    b. Bostik Findley, "Chem-Calk 550".
    c. Pecora Corporation, "NR-200 Urexpan".
    d. Sika Corporation, "Sikaflex 2CSL"
    e. Tremco, Inc., "THC-900/901".
    f. Tremco, Inc., "Vulkem 45SSL".
    g. W. R. Meadows, Inc., "Pourthane".

2. Locations for Use: Exterior and interior expansion, control and construction joints in horizontal surfaces; and joints subject to pedestrian and light vehicular traffic.

D. One-Part Mildew-Resistant Silicone Sealant: Type S, Grade NS; Class 25, Uses NT, G, A and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corp., "Dow-Corning 786"
    b. General Electric, "SCS 1702".
    c. Pecora Corp., "863 #345 White"
    d. Sika Corporation, Sikasil GP
    e. Tremco, Inc., "Tremsil 200"; White, Clear.

2. Locations for Use: Interior joints in vertical surfaces and terminal edges of tile; and joints At damp areas, such as around sinks and plumbing fixtures and pipe penetrations; and

exposed terminal edges of vinyl flooring, such as around door frames and terminations at concrete.

2.3 LATEX JOINT SEALERS:

A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part nonsag, acrylic, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than ± 7.5%.

1. Products: Subject to compliance with requirements, provide with one of the following:

   a. "Chem-Calk 600"; Bostik Construction Products Div.
   b. "AC-20"; Pecora Corp.
   c. "Tremflex 834"; Tremco Inc.

2. Locations for Use: Interior joints in field-painted vertical and overhead surfaces at perimeter of metal door frames, gypsum drywall, plaster and concrete or concrete masonry; and all other interior locations not indicated otherwise.

2.4 FIRE-RESISTANT JOINT SEALERS:

A. Refer to Section 07270 - "Firestopping," for additional information and detailed requirements.

2.5 ACOUSTICAL JOINT SEALANTS:

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Manufacturers/Products: Subject to compliance with requirements, provide preapproved equivalent to one of the following:

1. Pecora Corporation; AC-20 FTR or AIS-919.
2. USG Corporation; SHEETROCK Acoustical Sealant.

C. Locations for Use: At locations indicated for various materials and systems, including in part, both sides of stud tracks for interior stud wall assemblies, top flange of lay-in ceiling grids and gypsum ceiling supporting grid systems and other locations so indicated.

2.6 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint-Fillers:

1. Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2. Backer Rod: Premium grade, closed cell polyethylene foam rod; Sealtight Backer Rod, as manufactured by W.R. Meadows, Inc., or approved equivalent.
3. Joint Filler: "Ceramar" flexible foam expansion joint filler, as manufactured by W.R. Meadows, Inc., or approved equivalent.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS:

A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.

C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surface adjacent to joints.

D. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Require Installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove latence and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which re not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS:

A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

D. Installation of Sealant Backings:

1. Install sealant backings to comply with the following requirements:
2. Install joint-fillers of type indicated or recommended by sealant manufacturer to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint-fillers.
    b. Do not stretch, twist, puncture or tear joint-fillers.
    c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

3. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants:

1. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants

from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

2. Concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 PROTECTION AND CLEANING:

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF JOINT SEALERS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08110

STEEL DOORS AND FRAMES

PART - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 04200 - "Unit Masonry"
2. Section 06100 - "Rough Carpentry"
3. Section 08211 - "Flush Wood Doors"
4. Section 08710 - "Finish Hardware"
5. Section 08800 - "Glass and Glazing"
6. Section 09250 - "Gypsum Drywall"
7. Section 09900 - "Painting"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes steel doors and steel frames.

1. All frames shall be equally and double rabbetted; except where single-rabbetted frames are specifically indicated on the Drawings - if any.

1.3 QUALITY ASSURANCE:

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.

B. Fire-Rated Door Assemblies:

1. Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows," and have been tested, listed and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
2. Labels mounted on doors and door frames must indicate the time rating of the door/frame assembly.

C. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.

C. Shop Drawings:

1. Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
2. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
3. Coordinate glazing frames and stops with glass and glazing requirements.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

C. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equivalent in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

D. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

E. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide steel doors and frames by one of the following:

1. Steel Doors and Frames, (General):

a. Amweld Div, American Welding & Mfg. Co.,
b. Builder's Manufacturing Company
c. Ceco Corp.
d. Curries Manufacturing, Inc.
e. Dittco Products Inc.
f. Fenestra Corp.
g. Habersham Metal Products Company
h. Mesker Industries, Inc.

i. MPI Group.
j. Overly Manufacturing Company
k. Pioneer Bldrs. Products Corp./Div. CORE Industries, Inc.
l. Republic Builders Products Corp./Subs. Republic Steel.
m. SteelCraft/Div. American Standard Co.

2. Thermal Rated Steel Door and Frame Assemblies:

a. Subject to compliance with requirements, any above named manufacturer.
b. Ceco Corp.
c. Copco Door Co.
d. Curries Mfg., Inc.
e. Fenestra Corp.
f. Mesker Industries, Inc.
g. Pioneer Bldrs, Products Corp./Div. CORE Industries, Inc.

2.2 MATERIALS:

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM SA 568.

C. Galvanized or Galvanealed Steel Sheets; Smooth and Paintable Finish: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized; or ASTM A60 Galvannealed.

D. Supports and Anchors: Fabricate of not less than 18-gage galvanized sheet steel.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

F. Galvanizing Repair Paint: High zinc dust content paint for repair of galvanized surfaces damaged by fabrication or welding, complying with M.I. Specification MIL-P-21035.

G. Shop Applied Primer: Rust-inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints.

2.3 FABRICATION:

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

D. Fabricate exterior doors, panels and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels.

1. Use galvanizing repair paint for surfaces damaged by fabrication or welding.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Thermal-Rated (Insulating) Assemblies:

1. At exterior locations and elsewhere as shown or scheduled, provide doors which have been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236.
2. Unless otherwise indicated, provide urethane insulated thermal-rated assemblies with U factor of 0.12 Btu, (hr. x sq. ft. x deg. F) at 15 mph exterior wind velocity when tested in accordance with ASTM C 1363, or better.

G. Finish Hardware Preparation:

1. Prepare doors and frames to receive mortise and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.
2. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
3. Locate finish hardware as indicated on final shop drawings, or if not indicated, in accordance with "Recommended Locations for Builders' Hardware," published by Door and Hardware Institute.

H. Shop Painting:

1. Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.
3. Use galvanizing repair paint for surfaces damaged by fabrication or welding, prior to prime coat.
4. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
5. Do not paint fire labels on doors or frames.

2.4 STANDARD STEEL DOORS:

A. Provide metal doors of types and styles as indicated on drawings or schedules, of seamless, hollow steel construction with 16-gauge face sheets. Form exterior doors of hot dip galvanized steel.

2.5 STANDARD STEEL FRAMES:

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricated frames of minimum 16-gauge cold-rolled furniture steel.

1. Frames for doors 7'-10" or more in height and/or over 3'-5" in width: 14 gauge cold-rolled furniture steel, and one additional hinge, whether or not indicated in hardware schedule.

B. Frames shall be formed by press brake with corners sharp and true. Corners shall be mitered and accurately fitted, and shall be fully electrically welded and then ground smooth. Removable spreaders shall be welded to the bottom of the frame. Frames shall be accurately mortised for hardware.

C. A minimum of three wall anchors shall be provided at each jamb, except four at doors 7'-10" high or more, and six at doors 10-foot high or more. Anchors shall be attached to door frames, adjustable, suitable for wall conditions and job requirements, and shall be 16 gauge minimum. Floor anchors shall be provided and welded to foot of each jamb with two 5/16" holes for securing to the floor.

D. Reinforcements of adequate gauge shall be provided for strikes, closers and brackets and other surface applied hardware for field drilling and tapping.

E. Form exterior frames of hot dip galvanized steel.

F. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames. Provide silencers equivalent to "GJ64" silencers as manufactured by Glenn-Johnson Corp., for metal frames, when not provided under the work of Section 08710 - "Finish Hardware."

1. Provide additional door silencers at doors over 3'-0" wide or 7'-0" in height.

G. Plaster Guards: Provide 26-gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation.

2.6 DOOR LOUVERS:

A. Provide prefinished louvers according to SDI 111C, at locations indicated, with blades or baffles formed of 0.0239-inch (0.6-mm) thick cold-rolled steel sheet set into minimum 0.0359-inch (0.9-mm) thick steel frame; Galvanized at exterior.

1. Sight-Proof Louvers: Stationary louvers constructed with inverted Y-shaped blades. Minimum free air area calculated per AMCA shall be 36-percent.

a. Refer to Division 15 "Mechanical" for door louvers with fire dampers.

2. Finish:

a. Surface Preparation: Solvent clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

b. Pretreatment: Immediately after surface preparation, apply conversion coating of type suited to organic coating applied over it.
c. Baked Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat baked enamel finish, consisting of prime coat and thermosetting topcoat that complies with ANSI A250.3. Comply with paint manufacturer's current written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.0508 mm).
d. Color and Gloss: As selected by Architect from manufacturer's full range of choices for standard non-metallic colors and gloss.

3. Final finish painting is specified in Section 09900 - "Painting," not the work of this Section 08110.

B. Provide removable bird screens for exterior louvers.

1. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated.
2. Provide frames consisting of U-shaped metal for permanently securing screen mesh.
3. Use 1/4-inch x 1/4-inch mesh formed with 0.063-inch diameter aluminum wire.
4. Color: To match louver, or black.
5. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12-inch o.c. between.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install standard steel doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Placing Frames:

1. Comply with provisions of SDI-1-06 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.
2. Except for frames located at in-place concrete or masonry, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
3. In masonry construction, locate a minimum of 3 wall anchors per jamb at hinge and strike levels. Add 1 wall anchor per jamb at hinge and strike levels for each whole 1'-10" height increment over 6'-0"; Similar at glazed and cased openings. Fill solid with grout as adjacent construction progresses.
4. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.
5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws. Add additional anchors as indicated in Paragraph 3.1-B3 above.
6. Install fire-rated frames in accordance with NFPA Std. No. 80.

C. Door Installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
2. Place fire-rated doors with clearances as specified in NFPA Std. No. 80.
3. Install silencers after all painting of doors and frames has been completed.

3.2 ADJUST AND CLEAN:

A. Prime Coat Touch-up:

1. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
2. Use galvanizing repair paint for galvanized surfaces, prior to prime coat.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF STEEL DOORS AND FRAMES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08211

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 06200 - "Finish Carpentry"
2. Section 08110 - "Steel Doors and Frames"
3. Section 08710 - "Finish Hardware"
4. Section 09900 - "Painting"
5. Division 15 - "Mechanical" (Door Louvers and Frames)

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes solid core flush wood doors with veneer faces and metal frames for any light openings.

B. Unless otherwise indicated, all wood doors will receive "transparent finish" specified in Section 09900 - "Painting".

1.3 SUBMITTALS:

A. Product Data: Submit door manufacturer's technical data for each type of door, including details of core and edge construction, and trim for openings and louvers.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, details of metal frames for light openings, location and extent of hardware blocking, fire ratings, and other pertinent data.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

1. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).

2. AWI Quality Standard: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. NWWDA Quality Marking:

1. Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.

2. For manufacturers not participating in NWWDA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction.

D. Manufacturer:

1. Obtain doors from a single manufacturer, selecting from manufacturers listed herein.

2. Other manufacturers may be considered however, approval must be requested from the Architect in writing at least ten (10) days prior to original bid date. Architect will issue only written approval, via letter and/or Addendum, and conditionally subject to compliance with specified requirements.

1.5 PRODUCT DELIVER, STORAGE AND HANDLING:

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors" as well as with manufacturer's instructions.

B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS:

A. Conditioning:

1. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:

2. Referenced AWI quality standard including Section 100-S-3 "Moisture Content".

1.7 WARRANTY:

A. General: Warranties shall run concurrently with, be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents or otherwise.

B. Door Manufacturer's Warranty:

1. Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist), or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

2. Warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

3. Warranty shall be in effect during following period to time after date of Substantial Completion.

a. Solid Core Interior Doors: Life of installation.

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, provide doors on one of the following:

1. Solid Core Doors with Wood Veneer Faces:

a. Algoma Hardwoods, Inc.
b. Eggers Industries, Architectural Door Division.
c. Ipik Door Co., Inc.
d. Marshfield Door Systems, Inc.
e. Oshkosh Architectural Door Co.

2. Metal Frames for Light Openings in Fire Rated and Other Doors: Manufacturer's standard beveled or square frame of 18-gage cold-rolled steel, factory-primed, and approved for use in door of fire-rating indicated or required, and in other doors where indicated.

2.2 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors: Comply with the following requirements.

1. Faces for Transparent Finish: Select White Birch; Plain Sliced; Consistent similar appearance on all doors.

a. AWI Veneer Grade: A
b. Matching: Book Match, Balanced Center Match.
c. Stain: Color to be selected from Manufacturers Premium Series full range of colors.
d. Similar color and appearance at both sides of doors.

2. Faces for Opaque Finish: Birch, Red Oak, White Oak, or other close-grained hardwood permitted by referenced standards; Rotary cut.

3. AWI Grade:

   a. Transparent Finish: Premium.

   b. Opaque Finish: Custom.

4. Solid Core Construction: PC-5 (Particle board core, 5-ply, hot-pressed method), except at wood doors where 30 percent or more of their area is glass use SLC-5 (Staved lumber core, 5-ply, hot-pressed method).

B. Fire-Rated Solid Core Doors:

1. Comply with the following requirements: Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.

2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.

3. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of a single layer of treated lumber.

4. Pairs: Provide fire-rated pairs with fire-retardant stiles which are labeled and listed for kinds of applications indicated without formed steel edges and astragals.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

2. Reject doors with defects.

3.2 INSTALLATION:

A. Hardware: For installation see Division 8 Section "Finish Hardware", of these specifications.

B. Manufacturer's Instructions:

1. Install wood doors to comply with manufacturer's current written instructions and recommendations, and to comply with referenced AWI standard, and as indicated.

2. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA 80.

3. Trim light openings with moldings of material and profile indicated.

C. Job-Fit Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors of hardware. Seal cut surfaces after fitting and machining.

2. Fitting Clearances for Non-Rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.

4. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.

5. Bevel fire-rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Prefit Doors: Fit to frames for uniform clearance at each edge.

E. Field-Finished Doors: Refer to Section 09900 - “Painting” for requirements for finishing wood doors.

3.3 ADJUSTING AND PROTECTION:

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF FLUSH WOOD DOORS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 04200 - "Unit Masonry"
2. Section 06100 - "Rough Carpentry"
3. Section 07600 - "Flashing and Sheet Metal"
4. Section 07900 - "Joint Sealers"
5. Section 08710 - "Finish Hardware"
6. Section 08800 - "Glass and Glazing"

1.2 SUMMARY:

A. This Section includes the following types of prefinished, thermally broken exterior aluminum entrance and storefront systems and interior non-thermally broken aluminum storefront systems work:

1. Exterior flush exterior / front glazed, inside-glazed aluminum entrances and storefront (2-1/4" x 4-1/2" nominal); and any indicated interior flush center glazed non-thermally broken storefront (2-1/4" x 4-1/2" nominal):

   a. Wide stile exterior entrance doors with continuous-type hinge design, door frames and insulated glazing.
   b. Vestibule doors matching entrance doors, where vestibule doors are indicated, except non-thermal and for single-pane glazing.
   c. Thermally broken transoms, sidelights, and frames for entrances, and storefront framing systems at exterior locations.
   d. All related hardware, hinges, closers, and accessories for a complete and properly functioning system specified in Section 08710 - "Finish Hardware", except some weatherstripping, as specified herein.

2. If indicated, prefinished aluminum faced insulated panels in storefront framing system.
3. Sub-Sill: When storefront manufacturer requires a sub-sill, provide at all sill locations (whether or not indicated on the Drawings) matching 0.040-inch (minimum) brake-metal, with hemmed edges, turned up at rear and angled down at extended front/exterior edge. Set in solid bed of silicone sealant.

B. The extent of aluminum entrances and storefront is indicated on the Drawings.

C. Glazing shall be as specified elsewhere, but no less than 1-inch over-all insulated units with 1/4-inch minimum thickness at interior and exterior panes.

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. General: Provide aluminum entrance and storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.

B. Thermal Movement: Design the aluminum entrance and storefront framing systems to provide for expansion and contraction of the component materials. Entrance doors shall function normally over the specified temperature range.

1. The system shall be capable of withstanding a metal surface temperature range of 180 deg F (100 deg C) without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass, or other detrimental effects.

C. Design Requirements: Provide aluminum entrance and storefront systems that comply with structural performance, air infiltration, and water penetration requirements indicated.

1. Wind Loads: Provide aluminum entrance and storefront assemblies capable of withstanding wind pressures of **20 psf** inward and **20 psf** outward acting normal to the plane of the wall.
2. Design wind load at the project site at least **110 mph**, unless greater loads are indicated on Structural Drawings or otherwise required by applicable building codes.

D. Structural Performance: Conduct tests for structural performance in accordance with ASTM E 330. At the conclusion of the tests there shall be no glass breakage or permanent damage to fasteners, anchors, hardware or actuating mechanism. Framing members shall have no permanent deformation in excess of 0.2 percent of their clear span.

1. Deflection Normal to the Plane of the Wall: Test pressure required to measure deflection of framing members normal to the plane of the wall shall be equivalent to the wind load specified above. Deflection shall not exceed 1/360 of the clear span, when subjected to uniform load deflection test.
2. Deflection Parallel to the Plane of the Wall: Test pressures required to measure deflection parallel to the plane of the wall shall be equal to 1.5 times the wind pressures specified above. Deflection of any member carrying its full dead load shall not exceed an amount that will reduce glass bite below 75 percent of the design dimension and shall not reduce the edge clearance between the member and the fixed panel, glass or other fixed member above to less than 1/8-inch. The clearance between the member and an operable door or window shall be at least 1/16-inch.

E. Air Infiltration: Provide aluminum entrance and storefront framing system with an air infiltration rate of not more than 0.06 CFM per sq. ft. of fixed area (excluding operable door edges) when tested in accordance with ASTM E 283 at an inward test pressure differential of 1.57 psf.

F. Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E 331 at an inward test pressure differential of 6.24 lbf per sq. ft.

G. Condensation Resistance: Where framing systems are "thermal-break" construction, provide units tested for thermal performance in accordance with AAMA 1503 showing condensation resistance factor (CRF) of not less than 45.

H. Thermal Transmittance: Provide framing systems that have an overall U-value of not more than 0.65 BTU/(hr. x sq. ft. x deg. F) at 15 mph exterior wind velocity when tested in accordance with AAMA 1503.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1. Product data for each aluminum entrance and storefront system required, including:

   a. Manufacturer's standard details and fabrication methods.
   b. Data on finishing, hardware and accessories.
   c. Recommendations for maintenance and cleaning of exterior surfaces.

2. Shop drawings for each aluminum entrance and storefront system required, including:

   a. Layout and installation details, including relationship to adjacent work.
   b. Elevations at 1/4-inch scale.
   c. Detail sections of typical composite members.
   d. Anchors and reinforcement.
   e. Hardware mounting heights.
   f. Provisions for expansion and contraction.
   g. Glazing details.

3. Hardware Schedule: Submit complete hardware schedule organized into sets based on hardware specified. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening.
4. Samples for Color Selection: Submit pairs of samples of each specified color and finish on 12-inch-long sections of extrusions or formed shapes. Where normal color variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of color variations.
5. Samples for Verification Purposes: The Architect reserves the right to require samples, that show fabrication techniques and workmanship, and design of hardware and accessories.
6. Test Reports: Provide certified test reports from a qualified independent testing laboratory showing that aluminum entrance and storefront systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an Installer with at least five (5) verifiable years experience in and who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project and whose work has resulted in construction with a verifiable record of successful in-service performance.

B. Manufacturer's Qualifications: Provide aluminum entrances and storefront systems produced by a firm with at least five (5) years experience in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.

C. Refer to Division 1 Section “Special Conditions”, for additional information and minimum experience requirements.

D. Single Source Responsibility: Obtain aluminum entrance and storefront systems, and structural sealants, from one source and from a single manufacturer.

E. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance and storefront work required and are based on the specific types and models indicated. Aluminum entrance and storefront by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept, as judged solely by the Architect. The burden of proof of equality is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer’s current written instructions and recommendations.

B. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.

C. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.

1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

D. Refer to Division 1 Sections “Summary of Work” and “Special Conditions” for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.

1. Coordinate fabrication tolerances to ensure proper fit.

1.8 WARRANTY:

A. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to:

1. Structural failures including excessive deflection, excessive leakage or air infiltration.
2. Faulty operation.
3. Deterioration of metals, metal finishes, accessories, any muntins, and other materials beyond normal weathering.

B. Warranty Period:

1. Labor and Materials: **3 years** after the date of project Substantial Completion.
2. Special Finish Warranty ("Kynar 500"): **20 years** after date of project Substantial Completion.

C. The above warranty shall be in addition to, shall be in effect simultaneously with, and shall not alter other project or product warranties or guarantees, nor shall it serve as a limitation to other remedies available to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide entrance and storefront systems manufactured by one of the following, at locations where each type is indicated on the Drawings:

1. Amarlite Architectural Products.
2. Atlas Architectural Metals, Inc.
3. Coral Architectural Products
4. Kawneer Company, Inc. (*Basis of Design*)
5. PPG Industries.
6. Tubelite, Inc.
7. United States Aluminum Corp.
8. Vistawall Architectural Products
9. YKK Architectural Products

B. Exterior Entrances and Storefront: Thermally broken 2-inches x 4-1/2-inches nominal; flush exterior / front glazed, inside glazed, and as indicated, with stiffeners and/or structural reinforcement as required to comply with project loads and windload requirements, equivalent to the following; Muntins (if any) as indicated at exterior, interior and between insulated glass panes:

1. Kawneer Series 451-T (*Basis of Design*)
2. U.S. Aluminum Series 451.
3. YKK YES 45 TU

C. Interior Storefront: Matching, non-thermally broken, 2-inches x 4-1/2-inches nominal, flush center-glazed, and as indicated, with stiffeners and/or structural reinforcement as required to comply with project loads and windload requirements, equivalent to the following:

1. Kawneer Series Trifab 451 (*Basis of Design*).
2. U.S. Aluminum Series 451.
3. YKK YES 45 CI

2.2 MATERIALS:

A. Aluminum Members: Alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish; comply with ASTM B 221 for aluminum extrusions, ASTM B 209 for aluminum sheet or plate, and ASTM B 211 for aluminum bars, rods and wire.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 611.
3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

C. Glass and Glazing Materials: Comply with requirements of Division 8 Section "Glass and Glazing" of these specifications.

D. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.

1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125-inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
2. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.

    a. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. Concealed Flashing: 0.0179-inch (26 gage) minimum dead-soft stainless steel, or 0.026-inch-thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.

F. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements; where use of aluminum is not feasible provide nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123.

G. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

H. Concrete and Masonry Inserts: Provide cast iron, malleable iron, or hot-dip galvanized steel inserts complying with ASTM A 123.

I. Framing Gaskets: As recommended by manufacturer for joint type.

J. Framing Sealants: Special silicone glazing sealants as indicated on the Drawings, and otherwise as indicated in Division 7 Section "Joint Sealants", and as recommended in writing by manufacturer for joint type.

K. Perimeter Sealants: Special configuration using double line sealant, at exterior face of assembly with closed cell backer rod, and at exterior face of substrate / back-up wall with open cell backer rod; Both joints 5/8-inch in width, with equivalent to "Dow Corning 795" silicone sealant, in color selected by Architect.

L. Weatherstripping:

1. Compression Weatherstripping: Manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.
2. Sliding Weatherstripping: Manufacturer's standard replaceable weatherstripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

2.3 HARDWARE:

A. General: Refer to Section 08710 - "Finish Hardware" for requirements finish hardware, except weatherstripping.

B. Hardware Schedule (per door): Equivalent to the following.

1 Door Bottom	Manufacturer's standard EPDM blade gasket sweep strip.
1 Set Weatherstripping (single acting doors)	"Sealair" system in door and frame, with continuous dense, bulb polymeric material.
1 Set Weatherstripping (double acting doors)	Pile cloth system in door and frame, continuous.

C. Accessories — As required by project conditions.

2.4 COMPONENTS:

A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated. Include subframes and other reinforcing members of the type indicated. Provide for flush glazing storefront from the interior on all sides without projecting stops. Shop-fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.

1. Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.

B. Entrance Door Frames: Provide tubular and channel frame entrance door frame assemblies, as indicated, with welded or mechanical joints in accordance with manufacturer's standards. Reinforce as necessary to support required loads, and reinforce at all door jambs.

C. Stile-and-Rail Type Entrance Doors: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts.

1. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for nonremoval.
2. Design: Provide 1-3/4-inches-thick doors of design indicated.

a. Wide stile; 5-inch wide face, unless indicated otherwise.

b. Bottom Door Stile: 10-inches total height, MINIMUM, unless greater height is indicated on the Drawings.

2.5 FABRICATION:

A. General: Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated, with maximum and minimum dimensions required, to achieve design requirements and coordination with other work.

1. Thermal-Break Construction: Fabricate storefront framing system with an integrally concealed, low-conductance thermal barrier, located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact. Use manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.

B. Prefabrication: Complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.

1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

C. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish.

1. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.

D. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.

E. Dissimilar Metals: Separate dissimilar metals with bituminous paint, or a suitable sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead, or asbestos.

F. Continuity: Maintain accurate relation of planes and angles with hairline fit of contacting members.

G. Fasteners: Conceal fasteners wherever possible.

H. Weatherstripping: For exterior and vestibule doors, provide compression weatherstripping against fixed stops. At other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.

1. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail (not face applied), adjustable for contact with threshold.

2.6 INSULATED SPANDREL PANELS (if any)

A. Insulated Spandrel Panels: Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.

1. Equivalent to standard products of Mapes Architectural Products; Lincoln NE; Phone: 1-800-228-2391 or (402) 466-1985.
2. Overall Panel Thickness: 1 inch (25.4 mm), unless greater thickness is indicated on the drawings.
3. Exterior Skin: Aluminum.

    a. Thickness: 0.040-inch.
    b. Finish: Matching framing finish system.
    c. Texture: Smooth texture, unless specifically indicated otherwise.
    d. Backing Sheet: Manufacturer's standard, either 1/8-inch- (3-mm-) thick tempered hardboard, 0.157-inch- (4-mm-) thick cement board, or 0.125-inch- (3.2-mm-) thick, corrugated, high-density polyethylene.

4. Interior Skin: Aluminum.

    a. Backing Sheet: Same as exterior backing sheet.

5. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.

6. Surface-Burning Characteristics: For exposed interior surfaces of panels, when tested according to ASTM E 84 as follows:

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

2.7 FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Finishes:

1. High Performance Organic Coating: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below); Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
2. Fluoropolymer Coating: Manufacturer's standard **2-COAT** (i.e.: primer and color coat), and note that the finish system may be a traditional liquid or powder coat, complying with AAMA 2605; thermo-cured, full-strength 70 percent resin "Kynar 500" coating and 30 percent reflective gloss when tested in accordance with ASTM D 523; Dry film thickness of 1.6-mils, minimum. Provide 2-coat finish on underside of panels where exposed to view

in the finished work, and manufacturer's standard primer and wash coating at concealed locations.

3. Color and Gloss: As selected by Architect, from manufacturer's standard non-metallic colors; 15 minimum, to include in part, medium bronze and white. Interior and exterior storefront colors may be different colors.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances and storefronts. Correct unsatisfactory conditions before proceeding with the installation.

1. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION:

A. Comply with manufacturer's current written instructions and recommendations for installation, for each product and system.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. Provide proper support and anchor securely in place.

C. Construction Tolerances: Install aluminum entrance and storefront to comply with the following tolerances:

1. Variation from Plane: Do not exceed 1/8-inch in 12 feet of length or 1/4-inch in any total length.
2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16-inch.
3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8-inch.
4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32-inch.

D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
2. Paint dissimilar metals where drainage from them passes over aluminum.
3. Paint aluminum surfaces in contact with mortar, concrete or other masonry with alkali resistant coating.
4. Paint wood and similar absorptive material in contact with aluminum and exposed to the elements or otherwise subject to wetting, with two coats of aluminum house paint. Seal joints between the materials with approved sealant.

E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

F. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Comply with requirements of Division 7 for sealants, fillers, and gaskets.

G. Refer to "Glass and Glazing" Section of Division 8 for installation of glass and other panels indicated to be glazed into doors and framing, and not preglazed by manufacturer.

1. Refer to Drawings for locations of insulated panels which may occur in place of glazing and/or at interior side behind glazing in applied stops.

3.3 ADJUSTING:

A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

3.4 CLEANING:

A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

B. Clean glass surfaces after installation, complying with requirements contained in the "Glass and Glazing" Section for cleaning and maintenance. Remove excess glazing and sealant compounds, dirt and other substances from aluminum surfaces.

3.5 PROTECTION:

A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF ALUMINUM ENTRANCES AND STOREFRONTS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. The work in this section shall include the furnishing of all items of finish hardware as hereinafter specified, or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specification.

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

1.2 RELATED WORK:

A. The following section of this specification should be examined in order to identify materials or equipment which may be obtained through this section.

1. Section 08110 - “Steel Doors and Frames”
2. Section 08211 - “Flush Wood Doors”
3. Section 08410 - “Flush Wood Doors”

1.3 DESCRIPTION OF WORK:

A. Finish Hardware: Hardware used in building construction but particularly that used on or in connection with doors, frames, cabinets and other movable members. It also has a finished appearance as well as functional purpose and may be considered as a part of the decorative treatment of a room or building.

1.4 QUALITY ASSURANCE:

A. Hardware has been specified herein by manufacturers’ name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function. No other products will be furnished unless approved by means of 1.4 Paragraph “D”.

B. To insure a uniform basis of acceptable materials, it is the intention that only manufacturers’ item specified as “acceptable and approved” be furnished for use on this project.

C. Deviation from or modification of items will be permitted only for special instances caused by reason of construction characteristics and for the purpose of providing proper operational function. The contractor shall be responsible for checking any necessary deviations in order that hardware shall fit and function properly.

D. Substitutions: Request for substitutions of items of hardware other than those listed as “acceptable and approved” shall be made to the architect no later than ten (10) 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. Substitution requests for mortise locks, door closers and exit devices shall include a physical sample. Lack of this information will result in a refusal.

E. Supplier: A recognized builders hardware supplier whose principal office and place of business is located within 150 miles of the project site, who has been furnishing hardware in the project's vicinity for a period of not less than five (5) years; and who is, or has in full time employment an Architectural Hardware Consultant (AHC) in good standing as certified by the American Society of Architectural Hardware Consultants, or equivalent, and who is a direct distributor of the products approved, for warranty purposes. This paragraph will be strictly enforced. All schedules shall be signed by an AHC.

The supplier must have demonstrated willingness to coordinate field problems, and (upon reasonable compensation) to assist the Owner in re-keying and service operations. He must have a reputation for supplying quality material. Pre-bid approval is required; the following are accorded such approval in advance:

1. Mullins Building Products; Montgomery, AL
2. Brabner & Hollon; Mobile, AL
3. Builders Door & Hardware; Dothan, AL
4. Building Specialties; Birmingham, AL
5. Commercial Door Products; Montgomery, AL
6. Contract Hardware and Specialty Co.; Columbus, GA
7. Dothan Commercial Door; Dothan, AL
8. Mullins Building Products; Birmingham, AL
9. Rayford & Associates, Inc., Mobile, AL
10. Building Specialties; Florence, AL
11. Southern Sash; Montgomery, AL
12. U. S. Security Systems; Montgomery, AL
13. Wagstaff Taylor; Birmingham, AL
14. Kelley Brothers, Daphne, AL
15. Alabama Door & Hardware, Vance, AL

F. Refer to Division 1 Section “Special Conditions” for additional information and minimum experience requirements.

G. Products and installation under the work of this Section shall be in compliance with, in part, at least the more stringent provisions of the following, either the latest edition or latest adopted edition of the locality, and all revisions and amendments thereto:

1. Americans With Disabilities Act of 1990 (ADA) “Accessibility Guidelines” (ADA-AG), and all revisions and amendments thereto.
2. “2010 ADA Standards for Accessible Design”, Published in the Federal Register September 15, 2010.
3. American National Standards Institute (ANSI), ANSI A 117.1, 2009.
4. Uniform Federal Accessibility Standards (UFAS).
5. International Building Code, either the latest edition or latest adopted edition of the locality as applicable at the project locale.
6. Where this requires any substitution of products specified herein, advise Architect in writing for necessary approvals.

1.5 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. The finish hardware supplier shall, after award of a formal contract submit to the architect, six (6) complete computerized or typewritten (handwritten are not acceptable) copies of the proposed finish hardware schedule for approval. The schedule shall be prepared using the "sequence and format" for the Door and Hardware Institute (DHI). After approval of the schedule the hardware supplier shall provide three (3) copies of this approved schedule to the contractor for file and distribution purposes. Hardware will not be ordered by the hardware supplier until an approved schedule has been received. Horizontal schedules will not be acceptable. Provide vertical format.

C. When submitting schedules for approval, include two manufacturers' cut sheets on each hardware item proposed. Index it with the use of number or letters or a combination of both, with the hardware schedule. The index numbers/letters are to be in right hand column on the same line as the respective manufacturers' numbers. All manufacturers' numbers shall be indexed even when appearing more than once.

D. Templates: The hardware supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order that they may cut, reinforce or otherwise prepare their material or product to receive the hardware item. If physical hardware is required by any manufacturer the hardware supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. All items of hardware to be delivered to the job site shall be of completely packaged with all necessary screws, bolts, miscellaneous parts, instructions and where necessary installation templates for manufacturers' suggested installation. All boxes are to have a typed label with door hand, room location, item number and keying to conveniently identify them and their intended location in the building.

C. A representative of the general contractor shall receive the hardware when delivered at the job site. A dry locked storage space complete with shelving, shall be set aside for the purpose of unpacking, sorting, checking and storage.

D. Finish hardware shall be delivered to the general contractor by the hardware supplier. Direct factory shipments to the job site are not acceptable.

E. The hardware shall be jointly inventoried by the representative of the general contractor and the hardware supplier.

F. Items damaged in shipment shall be replaced promptly and with proper material without additional cost to the general contractor.

G. All hardware shall be handled in a manner to minimize marring, scratching or damage.

H. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 WARRANTY:

A. Provide manufacturers warranties from hardware supplier as follows:

1. Surface Door Closers: Twenty Five years.
2. Exit Devices: Mechanical: three years, Electro-Mechanical: one year.
3. Locksets: Cylindrical and Mortise: three years.
4. All other Hardware: One year.

B. The above warranties shall be in addition to, shall be in effect simultaneously with, and shall not alter other project or product warranties or guarantees, nor shall they serve as a limitation to other remedies available to the Owner.

PART 2 - SPECIFIC REQUIREMENTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the hardware schedule at the end of this section.

2.2 HARDWARE FINISHES

A. 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. Unless specified otherwise in the hardware sets, door hardware finishes shall be as specified below:

1. Butt Hinges: steel base metal, 652, Satin Chrome.
2. Continuous Hinges for Wood and Hollow Metal Doors: 628 (US28) Clear Anodized Aluminum.
3. Continuous Hinges for Aluminum Doors: Custom anodized aluminum color or Kynar paint finish as required to match the specified frame and door finish.
4. Flush Bolts: 626 (US26D) Satin Chrome Plated Brass/Bronze
5. Mortise Locks: 626AM Satin Chrome Plated, antimicrobial coating.
6. Cylindrical Locks: 626AN Satin Chrome Plated, antimicrobial coating.
7. Exit Devices: US26DAM Satin Chrome, with US32DAM Satin Stainless Steel Touch Bars, antimicrobial coating.
8. Door Closers: 689 Powder Coat Aluminum
9. Push Plates: 630AM (US32D) Satin Stainless Steel.
10. Pull Plates: 630AM (US32D) Satin Stainless Steel.
11. Exterior Door Pulls: 630AM Satin Stainless Steel, antimicrobial coating.
12. Protective Plates: 630 (US32D) Satin Stainless Steel
13. Door Stops: 626 (US26D) Satin Chrome Plated Brass/Bronze
14. Overhead Holders: 630 Satin Stainless Steel.
15. Thresholds and Weather-Stripping: 628, clear anodized aluminum.

2.3 HINGES & PIVOTS:

A. Templates Hinges at new frames and doors: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template hinges which conform to ANSI whenever applicable.

B. Hinge pins, except as otherwise indicated, shall be as follows:

1. Steel Hinges: Steel Pins.
2. Non-Ferrous Hinges: Stainless Steel Pins
3. Exterior Doors: Non-Removable Pins (NRP) or Security Stud
4. Out-Swing Corridor Doors: Non-Removable Pins (NRP), whether specified in the hardware sets or not.
5. Interior Doors: Non-Rising Pins
6. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip indicated.
7. Five Knuckle.

C. Where projection of door trim is such as to prevent desired degree of opening, the proper hinge width shall be provided to allow the door to clear the trim.

D. Acceptable and approved only as follows:

1. Ives
2. Bommer
3. Lawrence

E. Substitutions allowed only as described under paragraph 1.4.D of this section.

2.4 CYLINDERS, KEYS AND KEYING:

A. Provide large format key removable cores as manufactured by Schlage Lock Company. Permanent cores shall be Schlage Primus at exterior doors and Schlage Everest 29 series at interior doors. Match existing Schlage keyways used for previous Redland Road Elementary School project. All new key bittings shall be an extension of existing Schlage factory key records. All new cylinder cores and keys shall be keyed as directed by the owner. Keys and cores shall be ordered on a timely basis so as to not delay the project. Provide for future expansion of key bitting list by 100%.

B. Provide temporary brass construction cores for all keyed cylinders and locks. General contractor shall remove temporary brass construction cores and install permanent cores at completion of project. General contractor shall coordinate date of removal of construction cores with the owner. General Contractor shall return brass construction cores to the hardware supplier.

C. Key Quantities:

1. 3 Operating keys per cylinder, 8 for keyed alike groups.
2. 5 Master keys for each new master key group created.
3. 12 Construction master keys
4. 200 key blanks
5. 2 Construction Control Keys.

D. Visual Key Control: All permanent keys shall be stamped with their assigned key set symbol. All permanent keys, except one of each cut, shall be stamped "Do Not Duplicate". Keys not stamped Do Not Duplicate shall be tagged as file keys for storage in wall mounted key cabinet. File keys to be used for future duplication of keys. All permanent cores shall stamped or engraved in a concealed location, with their assigned key set symbols.

D. Provide one wall mounted key control cabinet; Lund Deluxe 1200 Series, two tag key system, 150% capacity for the project.

E. Provide one surface mount Knox Box, 3200 series. Provide unit compatible with City of Millbrook Fire Department Knox key system. General contractor shall install in location provided by architect.

2.5 LOCKSETS & LATCHSETS:

A. Accepted and approved as follows:

1. Schlage ND Series, RHO Design
2. Sargent 11 Line, LL Design
3. Corbin Russwin CL3100 Series, NZD Design

B. Provide lock function specified in the door hardware sets. All locks shall be equipped with strike dust boxes. Strike size shall be curved lip type, ASA 4 7/8", unless specified otherwise in the door hardware sets. All locks shall be ANSI grade 1, UL listed for fire door use.

C. All locksets shall be UL listed for life safety and fire. All locksets shall meet requirements of NFPA 80.

D. Electrified locksets shall be same manufacturer as mechanical locksets.

E. Substitutions allowed only as described in paragraph 1.4.D of this section.

2.6 SURFACE DOOR CLOSERS

A. Accepted and approved as follows:

1. LCN 4000/1400 series
2. Sargent 351/1431 Series
3. Norton 7500/8500 Series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron or cast aluminum cylinder, and full complement bearings at shaft.
3. Cylinder Body: Exterior Doors 1-1/2 inch (38 mm) diameter with 5/8 inch diameter double heat-treated pinion journal.

4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coat finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Supplier shall provide special templates, drop plates, mounting brackets, or adapters for closer bodies, closer arms as required for details, overhead stops, and other door hardware items interfering with closer mounting. Provide whether specified in the door hardware sets or not.
11. All surface door closers are to be through-bolt mounted using the closer manufacturer's fastener package. Substitution of fasteners is not permitted.

2.7 FLAT GOODS:

A. Accepted and approved only as follows:

1. Ives *
2. Burns
3. Trimco

B. It is the responsibility of the hardware supplier to provide proper screw attachments per wall or floor conditions for door stops.

C. Provide stops for each and every interior and exterior opening. Wall stops shall be of cast brass or bronze plated finish to match lock trim finish.

D. Kickplates and armor plates shall be equal to Ives "8400 series" and shall be mounted by sheet metal screws where indicated in hardware sets. All kick plates shall be .050" satin stainless steel, with screw holes drilled.

E. Substitutions allowed only as described under paragraph 1.4.D of this section.

2.8 THRESHOLDS AND WEATHERSTRIPPING:

A. Accepted and approved as follows:

1. Zero
2. National Guard
3. K.N. Crowder

B. Substitutions allowed only as described under paragraph 1.4.D of this section.

2.9 EXIT DEVICES

A. Accepted and approved only as follows:

1. Von Duprin 98 Series
2. Precision Apex 2000 Series
3. Detex 10 Series

B. Requirements:
1. All exit devices to be of one manufacturer and provided in same finish design as locksets.
2. Provide sex nuts and bolts for attachment of surface applied items to doors.
3. Devices shall be UL listed. Devices for fire rated openings shall bear factory installed UL markings that indicate approval for fire rated openings.
4. All exit devices shall be touch-bar type design.
5. All exit devices shall comply with ANSI A156.3, Grade 1.
6. Exit device lever trim shall be equal to Von Duprin break away vandal resistant #996L.
7. All exit devices shall be equipped with flush end caps.
8. All exit devices shall be equipped with guarded (deadlocking) latch bolts.
9. All exit devices shall be provided with anti-microbial coated stainless steel touch bars. Plastic touch pads or plastic covered touch pads will not be accepted.
10. Exit device power supplies shall be same manufacturer as exit device.
11. All exit devices are to be installed using through-bolts. All exit devices and exit device strikes shall be installed using manufacturer's supplied fasteners. Substitution of manufacturer's fasteners will not be allowed.

2.10 OVERHEAD HOLDERS AND STOPS

A. Accepted and approved only as follows:

1. Glynn Johnson
2. Rixson
3. Sargent

2.11 CONTINUOUS GEAR HINGES

A. Accepted and approved only as follows:

1. Ives
2. Markar
3. Select Products

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Mount hardware units at heights indicated in "recommended locations for builders hardware" for (standard steel doors and frames), (custom steel doors and frames), (wood doors and frames) by the Door and Hardware Institute (DHI), except if otherwise specifically indicated or to comply with requirements of governing regulations, requirements for the disabled or handicapped, or if otherwise directed by the Architect.

B. Degree of opening for doors with overhead holders, closers, etc., shall be included in the hardware schedule for the Architect's approval.

C. All hardware shall be installed by tradesmen skilled in the application of commercial grade hardware.

D. Install each hardware item in compliance with the instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortised parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking or excessive clearance. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted and finished in another way, the hardware shall be removed and stored prior to the painting or finishing. Items shall then be reinstalled only when the finishes have been completed on the surface to which the hardware is to be applied.

E. After installation, representative templates, instruction sheets and installation details shall be placed in a file folder to be turned over to the owner when the building is accepted. Included shall be at least five each of any special adjusting and/or installation tools furnished with the hardware by the manufacturers.

3.2 ADJUSTING AND CLEANING:

A. Adjust and check each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.

B. Final Adjustment: Wherever hardware installation is made more than one month prior to building acceptance or occupancy of a space or area. The installer shall return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items. Hardware shall be cleaned as necessary to restore current operation, function and finish. Door control devices shall be adjusted to compensate for final operation of heating and ventilating equipment.

3.3 PROTECTION:

A. Whenever hardware is located in areas where it may be subject to damage during construction by handling, cleaning, etc., (e.g., painting, cleaning of bricks) it shall be protected and/or removed from its location until the hazardous condition is terminated.

3.4 GENERAL NOTES:

A. Before installation of any hardware begins the contractor's installer shall contact the hardware supplier to discuss any special installation requirements for all hardware items. Their discussion shall include, but not be limited to such items as proper closer mounting, proper fasteners to be used for hardware, locksets and exit device backsets, etc.

B. Electric power tools should be used on hardware fasteners so as to prevent damage to screw heads.

C. Hardware supplier should verify all quantities in the following schedule.

3.5 SCHEDULES:

A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards of practice, or to meet state and local codes shall be furnished whether or not specifically called out in the following listed groups.

B. Supplier shall supply hardware for every numbered opening, whether specified in the above hardware sets or not. Hardware shall be same as similar openings.

C. Hardware Schedule: **TO BE DETERMINED**

END OF SECTION

SECTION 08800

GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 07900 - "Joint Sealers"
2. Section 08110 - "Steel Doors and Frames"
3. Section 08410 - "Aluminum Entrances and Storefronts"

1.2 SUMMARY:

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work in this section include glass and glazing for:

1. Metal doors, frames, entrances, and view windows.
2. Wood doors.
3. Glazing accessories.

C. General Locations - Glazing Types:

1. Insulating Low E Glass Assemblies shall be used at all exterior openings.
2. Single Pane Glass shall be used at all other locations, and at interior doors, view windows and lites.
3. Refer to Drawings and Specifications for locations where heat treated/tempered glass, etc., are required.

D. Insulating Glass Assemblies - Glass Colors: Clear.

1. Typical exterior glass in metal frames shall be as follows, fully tempered:

   a. Exterior Pane: 1/4-inch, clear glass with PPG Solarban 70XL, Low E at No. 2 surface, as specified.
   b. Interior Pane: 1/4-inch clear transparent glass, as specified.

2. Where spandrel glass (opaque) is indicated (if any), it shall be fully tempered, as specified and as follows:

   a. Exterior Pane: Typical 1/4-inch, clear glass with PPG Solarban 70XL, Low E at No. 2 surface, as specified.
   b. Interior Pane - Typical 1/4-inch spandrel glass, as specified.
   c. No light shall be visible through opacifier.

3. Exterior glass indicated to be "frosted," "obscure," or "etched," shall be as specified at Paragraph 2.5-C2 "Etched Glass," which requires smooth satin sandblasted finish on the exterior side of the inside pane (#3 surface).

E. Single Pane Glass Assemblies - Glass Colors:

1. Typical interior glass and glass at interior doors shall be as follows, unless otherwise indicated, and where fire-rated/impact-rated glass is required:

a. 1/4-inch clear transparent glass, as specified, fully tempered.

2. Spandrel glass (if any) shall be typical 1/4-inch gray tinted spandrel glass as specified, with same opacifier as for insulated glass on interior side.

a. Where spandrel glass is also indicted to be etched, smooth satin sandblast interior side and laminate over with a clear coating or same type and thickness of clear glass (acceptable to manufacturer of opacifier); apply typical opacifier to interior side; fully tempered.
b. No light shall be visible through opacifier.

3. Glass indicated to be "frosted," "obscure," or "etched," as specified in Paragraph 2.5-C2 "Etched" Glass, which requires smooth satin sandblasted finish on one side; fully tempered and laminate over with a clear coating or same type and thickness of clear glass.

a. Mount etched side of single pane glass facing toward the interior of the building.

1.3 SYSTEM DESCRIPTION:

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120^{O}F (67^{O}C) and from a consequent temperature range within glass and glass framing members of 180^{O}F (100^{O}C), minimum. Modify as required for more extreme conditions.
2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.
3. Deterioration of coated glass is defined as the development of manufacturing defects including peeling, cracking or other indications of deterioration in metallic or other coating due to normal conditions of use.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.

C. Samples: Submit, when requested by Architect, for verification purposes, 12-inch square samples of each type of glass indicated except for clear single pane units, and 12-inches long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color.

D. Certificate: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

E. Warranty: Submit sample of manufacturer's warranty for each product for which a warranty is either required by these Specifications or otherwise available from the manufacturer.

1.5 QUALITY ASSURANCE:

A. General: All glass shall comply with FS DD-G-451, except where more stringent standard is indicated or required by authorities having jurisdiction.

1. At locations where glass size cannot be supplied as indicated, provide similar glass in better quality and/or greater thickness; Coordinate with glass framing.
2. Furnish each piece of glass with a label indicating type, quality, thickness, etc., and do not remove until after written approval is received from Architect and Owner's representative.

B. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual", and SIGMA TM-3000, "Vertical Glazing Guidelines", except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

C. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of the inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC): Certification: CBA.

E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

F. Subcontractor Qualifications: Glazing Subcontractors shall comply with experience requirements for work on this project as stated in Section 01015 - "Special Conditions."

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.8 WARRANTY:

A. General: Warranties shall run concurrently with other warranties made by the Contractor under requirements of the Contract Documents, and shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents or otherwise.

1. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of each type of coated glass agreeing to furnish F.O.B. point of manufacture, with freight provided to project site, within specified warranty period indicated below, replacements and all installation costs and expenses for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking, wrinkling, discoloring, staining, or deterioration in metallic, or opacifier coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

a. Warranty Period: Manufacturer's standard but not less than **10-years** after date of project substantial completion.

2. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish F.O.B. point of manufacture, with freight provided to project site, within specified warranty period indicated below, replacements and all installation costs and expenses for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure of hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the

manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

a. Warranty Period: Manufacturer's standard but not less than **10-years** after date of substantial completion.

3. Manufacturer's Special Project Warranty on Laminated Glass: Provide written warranty signed by manufacturer of laminated glass agreeing to furnish F.O.B. point of manufacturer, with freight provided to project site, within specified warranty period indicated below, replacements and all installation costs and expenses for those laminated glass units which develop manufacturing defects. Manufacturing defects are defined as delamination, discoloring, staining, or deterioration in laminated glass units, due to normal project conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

a. Warranty Period: Manufacturer's standard but not less than **5-years** after date of entire project's substantial completion.

4. Replacements Under Warranties: Glass units replaced under Warranty provisions shall be required to carry the same warranty as original glass and glazing, beginning from the date of replacement completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Clear and Tinted Float Glass:

a. AGC Industries, Inc.
b. Ford Glass Division.
c. Guardian Industries Corp.
d. LOF Glass, Inc.
e. Oldcastle Glass
f. PPG Industries, Inc.
g. Saint-Gobain/Euroglass.

2. Manufacturers of Fire-Rated and Impact Resistant Glass:

a. AGC Industries, Inc.
b. Blue Ridge.
c. Guardian Industries Corp.
d. Hordis Brothers, Inc.
e. Oldcastle Glass
f. Pilkington Sales (North American) Limited.
g. Safti First
h. Viracon, Inc.

3. Manufacturers of Heat-Treated Glass:

    a. AGC Industries, Inc.
    b. Cardinal IG.
    c. Environmental Glass Products.
    d. Falconer Glass Industries.
    e. Ford Glass Division.
    f. Guardian Industries Corp.
    g. Hordis Brothers, Inc.
    h. LOF Glass, Inc.
    i. Oldcastle Glass
    j. PPG Industries, Inc.
    k. Safti *First*
    l. Saint-Gobain/Euroglass.
    m. Spectrum Glass Prod. Div., H. H. Robertson Co.
    n. Viracon, Inc.

4. Manufacturers of Coated Glass:

    a. Advanced Coating Technology.
    b. Cardinal IG.
    c. Environmental Glass Products.
    d. Falconer Glass Industries.
    e. Ford Glass Division.
    f. Guardian Industries Corp.
    g. Hordis Brothers, Inc.
    h. Independent Insulating Glass.
    i. Interpane Coatings, Inc.
    j. LOF Glass, Inc.
    k. Oldcastle Glass
    l. PPG Industries, Inc.
    m. Saint-Gobain/Euroglass.
    n. Spectrum Glass Prod. Div.; H.H. Robertson Co.
    o. Viracon, Inc.

5. Manufacturers of Insulating Glass:

    a. Advanced Coating Technology.
    b. AGC Industries, Inc.
    c. Cardinal IG.
    d. Environmental Glass Products.
    e. Falconer Glass Industries.
    f. Ford Glass Division.
    g. Guardian Industries Corp.
    h. Hordis Brothers, Inc.
    i. Independent Insulating Glass.
    j. Oldcastle Glass
    k. PPG Industries, Inc.
    l. Spectrum Glass Prod. Div.; H.H. Robertson Co.
    m. Viracon, Inc.

2.2 GLASS PRODUCTS, GENERAL:

A. Primary Glass Standard: Provide primary glass which complies with FS DD-G-451 and ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.3 PRIMARY GLASS PRODUCTS:

A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

B. Tinted Float Glass: Type I (transparent glass, flat), Class 2 (tinted heat absorbing and light reducing), Quality q3 (glazing select).

1. Light Gray: Manufacturer's standard tint, with visible light transmittance of 41-43 percent and shading coefficient of 0.67-0.69 percent for 1/4-inch thick glass.

C. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of clear transparent Low E glass and clear transparent glass, relative to visible light transmittance, U-values, shading coefficient and visible reflectance.

D. Ceramic-Coated Spandrel Glass - General: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, clear transparent glass with PPG Solarban 70XL or AGC Energy Select 28, Low E at No. 2 surface, and complying with other requirements specified.

1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.
2. Products - At locations indicated on the Drawings:

    a. Viracon: Viraspan, Lead-Free Spandrel Glass, V948 Medium Gray.
    b. No light shall be visible through opacifier.

E. Fire Rated, Laminated Safety Glass with Intumescent Interlayers: Proprietary Category II safety glazing product in the form of multiple lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Kind FT (fully tempered) float glass laminated with intumescent interlayers; and as follows:

1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Product: Subject to compliance with requirements, provide acceptable equivalent to "PyroStop" by Pilkington Building Products North America and distributed by Technical Glass Products.

2.4 HEAT-TREATED GLASS PRODUCTS:

A. Manufacturing Process: Manufacture heat-treated glass as follows:

1. By horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.

B. Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

1. Type: Fully Tempered.
2. Thickness: 1/4-inch, unless indicated otherwise.
3. Provide tinted glass only at locations indicated, if any.
4. Similar standards for tinted glass, Low-E glass, spandrel glass and other types of glass are applicable.

2.5 SEALED INSULATING GLASS UNITS:

A. General: All units shall be preassembled consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.

1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section and in Sections where the materials are provided, applicable to types, classes, kinds and conditions of glass products indicated.
2. Provide heat-treated panes of type and at locations indicated or, if not indicated, provide heat-strengthened (fully tempered) panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or required.
3. Performance characteristics designated for insulating glass are nominal values based on manufacturer's published test data for units with 1/4-inch thick panes of glass and 1/2-inch thick air space.

    a. U-values indicated are expressed in the number of Btu's per hour per square feet per degree F difference.

4. Performance Classification per ASTM E 774: Class A.

    a. Thickness of Each Pane: 1/4-inch, fully tempered unless indicated otherwise.
    b. Air Space Thickness: 1/2-inch, unless indicated otherwise.
    c. Sealing System: Manufacturer's standard, in compliance with referenced standards.
    d. Spacer Material: Aluminum, in compliance with referenced standards, same color as exposed framing where it occurs.
    e. Desiccant: Manufacturer's standard; either molecular sieve or silica gel or blend of both. Comply with requirements of referenced standards.
    f. Corner Construction: Manufacturer's standard corner construction.

B. Insulating Glass Units: Manufacturer's standard units complying with the following requirements; fully tempered safety glass where indicated or otherwise required by applicable codes and standards:

1. Exterior Pane: Clear glass with PPG Solarban 70XL or AGC Energy Select 28, Low E at No. 2 surface, as specified.

   a. Type: As indicated.
   b. Thickness: 1/4-inch, unless indicated otherwise.

2. Interior Pane of Glass: Clear transparent glass, unless indicated or required otherwise.

   a. Type: As indicated.
   b. Thickness: 1/4-inch, unless indicated otherwise.
   c. Obscure Glass (not patterned): At locations indicated, on the No. 3 unit surface.

3. Performance Characteristics: As indicated in specification sections where insulated glazing is provided.

C. Other Types of Insulated Glass Units: Provide at locations indicated on the Drawings, and as required by applicable codes, referenced standards, and/or authorities having jurisdiction.

1. Tempered Glass: Same as for general use, with interior and exterior glass fully tempered.
2. Etched Glass: Same as for general use except at insulated glass, exterior face of interior glass shall be smooth satin sandblasted to obscure vision through it; And where indicated for single pane etched glass, the interior face shall be similarly sandblasted and laminated over with a clear coating or same type and thickness of clear glass.
3. Insulated Spandrel Glass: Equivalent to Virocon, Inc's. "Viraspan Spandrel Glass," consisting of clear transparent glass with PPG Solarban 70XL or AGC Energy Select 28, Low E at No. 2 surface, fully tempered exterior lite, a 1/2-inch air space with spacers same color as framing where it occurs; 1/4-inch clear fully tempered interior lite with smooth satin sandblasted surface on the No. 3 surface (i.e.: exterior face of interior pane), and a ceramic frit opacifier on the No. 4 unit surface (i.e.: inside face of interior pane).

   a. Color of the ceramic frit shall be dark bronze or black, unless otherwise indicated.
   b. The opacifier frit for the No. 4 surface shall be coordinated with the Architect's samples and are subject to Architect's approval.

2.6 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES:

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.
4. Colors: Provide color of exposed sealants indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.
5. Asbestos prohibited: Refer to Section 01015 - "Special Conditions," for requirements.

B. Glazing Sealant: Use only the following materials, or pre-approved substitutes:

1. One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS, Class 25; Uses NT, G, A, and, as applicable to uses indicated, O; and complying with the following requirements for modules and additional joint movement capability.

    a. Low Modules: Tensile strength of 45 psi or less at 100-percent elongation when tested per ASTM D 412 after 14-days at 77^{O}F (20^{O}C) and 50-percent relative humidity.
    b. Additional capability, when tested per ASTM C 719 for adhesion and cohesion under maximum cyclic movement, to withstand the following percentage increase and decrease of joint width, as measured at time of application, and remain in compliance with other requirements of ASTM C 920.

2. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100- percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

C. Products: Subject to compliance with requirements, provide one of the following:

1. One-Part Non-Acid Curing Low-Modules Silicone Glazing Sealant:

    a. "Chem-Calk 1000"; Bostik Construction Products Div.
    b. "Dow Corning 790"; Dow Corning Corp.
    c. "864"; Pecora Corp.
    d. "Omniseal"; Sonneborn; BASF Building Systems.
    e. "Spectrum 1"; Tremco, Inc.

2. Preformed Butyl-Polyisobutylene Glazing Tape Without Spacer Rod:

    a. "Chem-Tape 40"; Bostik Construction Products Div.
    b. "Extru-Seal"; Pecora Corp.
    c. "PTI 303" Glazing Tape; Protective Treatments, Inc.
    d. "Tremco 440 Tape"; Tremco Inc.

3. Preformed Butyl-Polyisobutylene Glazing Tape With Spacer Rod:

    a. "Chem-Tape 60"; Bostik Construction Products Div.
    b. "Shim-Seal"; Pecora Corp.
    c. "PTI 303" Shim Tape; Protective Treatments, Inc.
    d. "Pre-shimmed Tremco 440 Tape"; Tremco Inc.

2.7 GLAZING GASKETS:

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene or EPDM gaskets, complying with ASTM C 864, of profile and hardness required to maintain watertight seal.

B. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.

C. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Preformed Gaskets:

a. D. S. Brown Co.
b. Maloney Precision Products Co.
c. Tremco, Inc.

2.8 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25- percent deflection.

2.9 GLAZING ACCESSORIES:

A. General: Provide accessories in quantities and at locations as indicated on the Drawings, including all components, templates, etc., required for complete and proper installation which is fully compatible with glazing at locations where accessories occur.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and

functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL:

A. Comply with combined current printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Clean and trim excess glazing materials from glass, muntins, frames, etc., promptly after installation.

3.4 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inches from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50-united-inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

F. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement.

I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

J. Provide cut-outs, where required, install glazing accessories at locations indicated.

3.5 PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended in writing by glass manufacturer.

D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

E. Wash glass on both faces not more than 4-days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

END OF GLASS AND GLAZING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 09250

GYPSUM DRYWALL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 06100 - "Rough Carpentry" (grounds and concealed P.T. blocking)
2. Section 07900 - "Joint Sealers" (acoustical and joint sealant)
3. Section 09900 - "Painting"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes the following types of gypsum board construction:

1. Gypsum board screw-attached to wood framing, where indicated.
2. Grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system (if any).
3. Gypsum sheathing, with air infiltration barrier (felt), building wrap and/or waterproofing underlayment, as indicated.
4. Prefinished extruded aluminum interior trim.
5. Notes:
   a. Extend framing and gypsum board up at fire-rated walls to bottom of fire-rated enclosures above (where occurs) or to roof or floor deck, and mud top edges.
   b. Extend non-rated walls up to bottom of structure.
   c. Extend only that partition framing specifically indicated as not full-height up to finished ceilings and tie-off every 4th stud to structure above.
   d. Completed work in repair and renovation work shall be flush with and to match finish texture to immediately adjacent materials and work.

1.3 DEFINITIONS:

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.4 SUBMITTALS:

A. Submit the following according to Conditions of the Contract and Division 1 Specifications Sections.

1. Current product data and installation instructions from manufacturers for each type of product specified; Six (6) Sets - minimum.

1.5 QUALITY ASSURANCE:

A. Fire-Resistance Ratings:

1. Where indicated, provide materials and construction which are identical with those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.
2. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File numbers in GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction.

B. Single Source Responsibility: Obtain all steel framing and all metal trim, and each type of gypsum board and related joint treatment materials from a single manufacturer.

C. Pre-Construction Conference: Prior to beginning work associated with roof system, the Contractor and appropriate subcontractors shall meet to discuss coordination of the work of the trades associated with the installation of the roof system, suspended acoustical and gypsum board ceiling, suspended mechanical ductwork, suspended light fixtures, etc. This work shall be planned and coordinated to provide hanger attachments needed by the various trades in a manner that will minimize conflict with installation of the roof system.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

C. Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

D. When materials are moved into the building, distribute pallets and loads evenly around work areas so as to avoid overloading structure, causing damage to any materials, interfering with work of other trades, etc.

E. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads, trim, etc.

F. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Environmental Requirements, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840, with gypsum board manufacturer's recommendations, and with adhesive manufacturer's recommendations, for before, during, and after installation.

B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg. F.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

1.8 SEQUENCING AND SCHEDULING:

A. Sequence installation of gypsum board and sheathing with installation of exterior cladding and roofing to comply with requirements indicated below:

1. Do not leave gypsum sheathing board exposed to weather after its application for more than one month or, if protected as indicated below, for more than 6 months:

a. Cover exterior surface of sheathing with a temporary air infiltration barrier equivalent to 6-mil polyethylene film. Apply covering immediately after sheathing is installed.
b. Remove covering just prior to installation of asphalt felt, face brick, and similarly applied exterior materials.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Grid or Direct Suspension Systems:

a. Armstrong World Industries, Inc.
b. CertainTeed
c. Chicago Metallic Corp.
d. USG Interiors, Inc.; United States Gypsum Company
e. Worthington Industries, Inc.

2. Gypsum Board and Related Products:

a. CertainTeed
b. Georgia-Pacific Corp.
c. Gold Bond Building Products Div., National Gypsum Company
d. Continental Building Products (formerly Lafarge Gypsum)
e. United States Gypsum Company

3. Extruded Moldings and Reveal Moldings:

a. AMICO
b. Fry Reglet Corporation
c. Gordan, Inc.
d. M&M Systems Corporation

2.2 GYPSUM BOARD:

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

B. Gypsum Wallboard: ASTM C 36, ASTM C 1396 and as follows:

1. Type: Type X at all locations; High Impact Resistant (ASTM C 1629) where exposed to view in the finished work and within 4'-0" of finished floor, unless otherwise indicated; and Standard Type X at walls, ceilings and furr-downs above the high impact resistant gypsum board.
2. Edges: Tapered and featured (rounded or beveled) for prefilling.
3. Thickness: 5/8-inch for general use, except where 1/4-inch layers (at least two layers) may be indicated or required for curved wall or ceiling assemblies.

C. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, ASTM C 1396 and as follows:

1. Type: Type X at all locations.
2. Edges: Manufacturer's standard.
3. Thickness: 5/8-inch.

D. Moisture-, Mold- and Mildew- Resistant Gypsum Board: ASTM C 36, ASTM C 1396, and as follows:

1. Type: Type X at all locations; Moisture-, mold- and mildew- resistant core and facings/surfaces; High Impact Resistant (ASTM C 1629) where exposed to view in the finished work and within 4'-0" of finished floor; and Standard Type X at walls, ceilings and furr-downs which occur above the high impact resistant gypsum board.
2. Edges: Manufacturer's standard.
3. Thickness: 5/8-inch.
4. Locations: At rooms with toilet fixtures and/or service sinks, entire wall behind sinks, and elsewhere only as indicated.
5. Use 5/8 inch thick equivalent to Georgia-Pacific "Dens-Shield" tile backer board with sealed and facing-taped joints, at ceramic and hard tile; ASTM C 1177 or ASTM C 1178.
6. Use "exterior gypsum board" where exposed at any exterior locations; ASTM C 931 or ASTM C 1396.
7. Old style "Green Board" WILL NOT BE ACCEPTABLE FOR ANY USE.

E. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, water-repellent surfaced on face, back and long edges; complying with ASTM C 79 and requirements indicated below:

1. Type: Type X at all locations.
2. Edge and End Configuration: Square.
3. Thickness: 5/8-inch, unless indicated otherwise on the Drawings.
4. Size: 4'-0" x 8'-0" or 9'-0" as required for coordination with framing.

5. **Note:** Use one of the following, with sealed and facing-taped joints at any exterior stud walls and exterior stud framing, **only** where plywood or other wood sheathing is not indicated.

   a. CertainTeed "GlasRoc Sheathing"

b. Georgia-Pacific "Dens-Glass Gold"
c. Gold Bond "e²XP"
d. Lafarge Weather Defense Platinum
e. USG "Securock"

6. Cover ALL SHEATHING with liquid applied membrane air infiltration barrier where specified in Division 7 Section.

2.3 TRIM ACCESSORIES:

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic, or metal combined with paper, with metal complying with the following requirement.

a. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.

2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

a. "LC" Bead, unless otherwise indicated.
b. "L" Bead where indicated or required.
c. "U" Bead where indicated.

3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

2.4 GYPSUM BOARD JOINT TREATMENT MATERIALS:

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape.

C. Drying-Type Joint Compounds:

1. Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.
2. Ready-Mix Formulation: Factory-premixed product.
3. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
4. Topping compound formulated for fill (second) and finish (third) coats.
5. All-purpose compound for use as both taping and topping compound.

D. Setting-Type Joint Compound:

1. Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

2. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

2.5 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

B. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.

C. Fasteners: Type S steel drill screws, 1-inch long unless otherwise required for shaft wall or multi-layer application, with corrosion-resistant finish in form of cadmium plating or proprietary coating, and as follows:

1. For attachment of gypsum board panels to framing of less than 0.033 of an inch in thickness (20 gauge), provide steel drill screws complying with ASTM C 1002.
2. For attachment of gypsum board panels, including sheathing, to framing from 0.033 (20 gauge) to 0.112 of an inch in thickness, provide steel drill screws complying with ASTM C 954.

D. Air Infiltration Barrier: Asphalt-saturated organic felt complying with ASTM D 226, Type 1 (No. 15 asphalt felt), unperforated; Unless indicated otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOR METAL SUPPORT SYSTEMS:

A. Ceiling Anchorages:

1. Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

3.3 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840 and GA-216.

B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24-inches in alternate courses of board.

C. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24-inches.

D. Install wall/partitions boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.

E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.

F. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

G. Attach gypsum board to studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

I. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32-inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

J. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.

1. Provide control joints in long partitions and walls at a maximum spacing of 30 feet on center, unless a closer spacing is indicated. Provide control joints in large ceiling areas at a maximum spacing of 50 feet on center in each direction, unless a closer spacing is indicated. Consult with Architect on locations of all control joints prior to beginning work.

K. Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except inside double or chase walls which are required to be braced internally.

1. Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
2. Fit gypsum board around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.
4. Fire-stop around penetrations as required by Codes and authorities having jurisdiction. Refer to Section 07270 for additional information and requirements.

L. Where interior partitions are indicated to extend to the structure above, the drywall shall also extend to the structure with the same number of layers as required below the ceiling.

M. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 1/2-inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

N. At all interior walls, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.

O. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

P. Install "sound batts" and insulation as the work progresses. Refer to Section 07210 for additional information and requirements.

3.4 METHODS OF GYPSUM BOARD APPLICATION:

A. Single-layer Application: Install gypsum wallboard as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated or required for fire or smoke resistive rated assemblies. Provide maximum length panels, to minimize end joints.
3. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.

B. Multi-Layer Application:

1. Install gypsum backing board for base layer and gypsum wallboard for face layer.
2. On ceilings apply base layer(s) prior to base layer application on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10-inches. Apply base layers at right angles to supports unless otherwise indicated.
3. On partitions/walls apply base layer(s) and face layers vertically (parallel to framing) with joints of base layers over supports and face layer joints offset at least one stud or furring member space from base layer joints.

C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.

D. Multi-Layer Fastening Methods:

1. Apply base layer(s) of gypsum board and face layer to base layer(s) as follows:
2. Fasten both base layer(s) and face layer separately to supports with screws.

3.5 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install "L" bead where edge trim can only be installed after gypsum board is installed.
3. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

D. Install edge trim where indicated on wall panels at juncture with ceilings.

E. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

3.6 FINISHING OF DRYWALL:

A. General: Apply treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

E. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing, except where finishing is required to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.7 GYPSUM WALL SHEATHING:

A. General:

1. Comply with manufacturer's current written instructions, GA 252, and the following for the installation of gypsum sheathing.

2. Cut boards at penetrations, edges and other obstructions of the work; fit tight against abutting work, except provide 3/8-inch setback where non-loadbearing work abuts structural elements at head and jambs.
3. Coordinate installation of sheathing with installation of flashing and joint sealers so that these combined materials are installed in the sequence and manner which prevents exterior moisture from passing through complete exterior wall assembly to the interior.
4. Apply fasteners so that screw heads bear tightly against face of gypsum sheathing boards but do not cut into face paper.
5. Do not bridge building expansion joints with gypsum sheathing; cut and space edges to match spacing of structural support elements.

B. Vertical Installation: Install 4-feet wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjoining boards. Screw-attach boards at perimeter and within field of board to each steel stud as follows:

1. Fasteners spaced approximately 8-inches o.c. and set back 3/8-inch minimum from edges and ends of boards.

C. Air Infiltration Barrier Application: Cover gypsum board sheathing with air infiltration barrier as follows:

1. Location: Apply felt type over gypsum sheathing occurring behind masonry veneer and waterproofing underlayment at metal siding.
2. Cut back air infiltration barrier 1/2-inch on each side of break in supporting members at control joint locations.
3. For asphalt-saturated organic felt and polyethylene film, apply horizontally with 2-inches overlap and 6-inches end-lap; fasten to sheathing with corrosion-resistant staples.

3.8 CLEANING AND PROTECTION OF WORK:

A. Promptly remove any joint compound and adhesives and similar residue from adjacent surfaces, as it may occur.

B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction remain without damage or deterioration at time of Substantial Completion.

END OF GYPSUM DRYWALL

SECTION 09511

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 06100 - "Rough Carpentry" (concealed P.T. wood blocking and grounds)
2. Section 07210 - "Building Insulation"
3. Section 07900 - "Joint Sealers"
4. Section 09250 - "Gypsum Drywall"

1.2 SUMMARY:

A. This Section includes acoustical and non-acoustical panel ceilings and clouds installed with exposed grid suspension systems; Generally, to match the predominant and similar existing panel ceilings and grid in this facility, including in part, finished appearance (colors as indicated, or if not indicated, as selected by Architect)

1. Type 1 (ACT-1): Square edge, acoustical panel system in Standard Finish Fine Line Grid (Acoustical panels), with special shape trim at walls at any cut edges replicating tegular edge.

2. Type 2 (ACT-2): Square edge, washable acoustical panel system in High Humidity Standard Finish Grid (Acoustical panels).

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified.
2. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

a. 6-inch-square samples of each acoustical panel type, pattern, and color.
b. Set of 12-inch-long samples of exposed suspension system members, including moldings, for each color and system type required.

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for Project, and which is acceptable to manufacturer of acoustical products herein, as indicated by written statement by their manufacturer(s).

1. Refer to Section 01015 - "Special Conditions", for additional experience requirements and information.

B. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. 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.

C. Acoustical Performance Characteristics: Provide acoustical ceiling systems which have been tested by UL or other acceptable independent testing organization, to certify compliance with STC and CAC minimum requirements indicated herein.

D. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit (ACT-1. ACT-2) from a preapproved manufacturer and a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

E. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and wall and partition systems.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. 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.

C. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

E. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.6 PROJECT CONDITIONS:

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.7 EXTRA MATERIAL:

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

1. Acoustical and Non-Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed, in whole unused cartons.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from the test surface) per ASTM E 795.

B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type, or if not indicated, as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for ceiling panels and exposed metal suspension systems of quality indicated herein.

2.2 ACOUSTICAL UNITS:

A. Type 1 (ACT-1): Manufacturer's standard lay-in non-directional random pattern, lightly fissured, heavily perforated panels, and as follows, unless indicated otherwise:

1. Size: 24 inches x 24 inches x 3/4 inch.
2. Edge: Square.
3. NRC Range: 0.70.
4. CAC Range: 40.
5. Color: White.
6. Light Reflectance: 0.85
7. Manufacturer/Product - Provide one of the following; Class A flame spread:
   a. Armstrong World Industries, Inc., "Fine Fissured" School Zone#1713, with standard "Humigard Plus" humidity resistance and "Bio-Block" mold/mildew resistant paint and treatment; with grid to match existing on site.
   b. CertainTeed
   c. USG Interiors, Inc.,
8. Grid: Standard hot-dipped galvanized steel in white color to match ceiling tile.

B. Type 2 (ACT-2): Manufacturer's standard lay-in smooth, textured vinyl faced panels, and as follows, unless indicated otherwise:

1. Size: 24 inches x 24 inches x 5/8 inch.
2. Edge: Square.
3. NRC Range: 0.50.
4. CAC Range: 38.
5. Color: White.
6. Light Reflectance: 0.82
7. Manufacturer/Product - Provide the following; Class A flame spread:
   a. US Sheetrock, Inc., "ClimaPlus" No. 3260, with standard humidity resistance and mold/mildew resistant paint and treatment; with 15/16" USG ZXLA Series grid.

2.3 METAL SUSPENSION SYSTEMS, GENERAL:

A. Standard for Metal Suspension Systems: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated, unless otherwise required.

1. High-Humidity Finish: Galvanized, aluminum capped grid. Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

   a. Product/Manufacturer:

      1) "Environmental ZXLA Grid System," as manufactured by USG Interiors or Donn.
      2) "Prelude Plus" Environmental Tee System, as manufactured by Armstrong World Industries, Inc.
      3) "Protectone" Series, as manufactured by CertainTeed.

C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched.

1. Gauge: Provide wire sized to that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gauge).

E. Hanger Rods - (as required): Mild steel, zinc coated, or protected with rust-inhibitive paint.

F. Angle Hangers - (as required): Angles with legs not less than 7/8 inch wide, formed with 0.0365-inch-thick galvanized steel sheet complying with ASTM A 446, Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.

G. 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 that fit type of edge detail and suspension system indicated.

H. Subject to compliance with requirements, provide suspension systems of one of the following:

1. Manufacturers of Steel Exposed Suspension Systems:

a. Same as ceiling panel unit manufacturer.
b. Armstrong World Industries, Inc.
c. CertainTeed.
d. Chicago Metallic Corporation.
e. Donn Corporation.

2. Manufacturers of Moldings and Trim:

a. Construction Specialties.
b. Fry Reglet Corporation.
c. Gordon, Inc.
d. MM Systems.
e. Technical Ceiling Systems, Inc.
f. Same as Suspension system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling and panel systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors, or supports, whose installation is specified in other sections.

1. Furnish galvanized inserts and similar devices as required for wood structure (if required), to other trades for installation well in advance of time needed for coordination of other work.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION:

A. General: Install acoustical ceiling and panel systems to comply with installation standard referenced below, per manufacturer's current written instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C 636.

B. Arrange acoustical units and orient directionally patterned units, (if any) in a manner shown by reflected ceiling plans.

1. Install panels with pattern running in one direction, as indicated, or if not indicated, as requested from and directed by Architect.

C. Suspend ceiling hangers from building structural members and as follows, with system leveling tolerance of 1/8 inch in 12'-0":

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure cable, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices that are secure and appropriate for structure to which cables and hangers are attached as well as for type of cable, hanger and hardware involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Space ceiling panel hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

    a. Provide additional hangers as necessary, so that one hanger occurs on each side of lay-in and surface-mounted light fixtures, and at other grid supported equipment, devices, etc.

6. Install “high humidity finish” systems at all areas indicated to receive lay-in vinyl-faced gypsum “non-acoustical” ceiling panels.
7. Install cable hangers with all indicated and otherwise necessary hardware for complete and proper installation of ceiling and panel systems.

D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units.

1. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

3.4 CLEANING:

A. 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. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 EXTRA MATERIALS:

A. Deliver extra materials stock as indicated above, to Owner.

END OF ACOUSTICAL PANEL CEILINGS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 01045 - "Cutting and Patching"
2. Section 03310 - "Concrete"
3. Section 07900 - "Joint Sealers"

1.2 DESCRIPTION OF WORK:

A. Extent of resilient flooring and accessories is shown on drawings and in schedules, including in part, the following:

1. Rubber Base (RB).
2. Preparation at areas to receive resilient flooring, including substrate testing, any necessary cleaning, and leveling and/or patching.

1.3 QUALITY ASSURANCE:

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

B. Fire Test Performance: Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1. Critical Radiant Flux (CRF): Not less than the following rating per ASTM E 648.

a. 0.45 watts per sq. cm.

2. Flame Spread: Not more than 75 per ASTM E 84.

3. Smoke Developed: Not more than 450 per ASTM E 84.

C. Flooring/Walkway Products: Products and installation, surfaces' co-efficient of friction (slip-resistance), etc., under the work of this Section shall be in compliance with the more stringent of applicable provisions of the following:

1. Published U. S. Justice Department Regulations for the "Americans with Disabilities Act of 1990" (ADA; ADA-AG);

2. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities", Published in the Federal Register July 23, 2004;

3. ANSI A117.1;

4. "Uniform Federal Accessibility Standards" (UFAS);

5. And revisions and amendments thereto.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to flooring application including, but not limited to, the following:

1. Substrate conditions, including at least results of pH, moisture content and adhesion testing (and any required retesting).

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and color selections for each type of resilient flooring and accessory, and installation instructions.

B. Maintenance Instructions: Submit 3 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

C. Substrate Testing Reports: Indicating each location of tests and results. Furnish additional copies as necessary for Contractor to include in Close-out Documents.

1.5 PROJECT CONDITIONS:

A. Maintain minimum temperature of 65^{O}F (18^{O}C) in spaces to receive resilient flooring for at least 48-hours prior to installation, during installation, and for not less than 48-hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48-hours before beginning installation. Subsequently, maintain minimum temperature of 55^{O}F (13^{O}C) in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture tests.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Rubber Wall Base:

a. Burke Flooring Products Div., Burke Industries, Inc.

b. Flexco Div., Textile Rubber Co.
c. Johnsonite/Tarkett, Inc.
d. R. C. Musson Rubber Co., Inc.
e. Roppe Rubber Corp. – *Basis of Design.*

2.2 WALL BASE:

A. Rubber Wall Base (RB-1): Provide rubber base complying with FS SS-W-40, with matching end stops and preformed or molded corner units, and as follows:

1. Basis of Design: RB-1
   a. MANUFACTURER: Roppe
   c. SIZE: 4" h x 1/8" thick
   d. COLOR: 123 Charcoal

2. Type (Material Requirement): TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).
3. Group (Manufacturing Method): I (solid).
4. Lengths: Cut lengths 48 inches (1219 mm) long, or coils in manufacturer's standard length.
5. Outside Corners: Premolded.
6. Inside Corners: Premolded.
7. Surface: Smooth.

B. Resilient Edge Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, as selected for condition at adjoining other floor surface material and a flush or "tapered" transition, color to match flooring, or as selected by Architect from standard colors available; not less than 1" wide.

1. Locate below door (if in closed position) and similarly at cased openings, at continuous VCT and at every edge of VCT, except as indicated below.

2. Omit accent strip at doorways where carpet strip, marble threshold, aluminum or other threshold is scheduled, indicated, or otherwise required.

C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

E. Leveling and Patching Compounds: Latex type as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

B. Perform bond and moisture tests on concrete subfloors in accordance with flooring manufacturer's and adhesive manufacturer's current written instructions and recommendations, to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

C. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.2 PREPARATION:

A. Prepare subfloor surfaces as follows:

1. Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.

2. Broom clean or vacuum surfaces to be covered, and inspect subfloor.

B. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.3 INSTALLATION - GENERAL:

A. Install resilient flooring using method indicated in strict compliance with manufacturer's current printed instructions and recommendations. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

1. Install resilient edge strips as resilient flooring work progresses.

B. Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

D. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas, if any. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.4 INSTALLATION OF BASE AND ACCESSORIES:

A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as longs as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of

resilient wall base with manufacturer's recommended adhesive filler material.

B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed, and as indicated above under "Part 2 - Products."

END OF RESILIENT FLOORING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces, except where noted otherwise.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
2. Pipe identification tags end markers or bands, direction of flow arrows, voltage identification, etc., if any, are provided under Division 15 - "Mechanical", and Division 16 - "Electrical."

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Examples of prefinished items not to be painted include, in part, the following factory-finished components:

a. Metal and phenolic toilet enclosures and partitions.
b. Acoustic materials.
c. Plastic laminate casework.
d. Finished mechanical and electrical equipment.
e. Light fixtures.
f. Switchgear.
g. Distribution cabinets.
h. Signage, Plaques, Directories, and Bulletin Boards.
i. Storefront.
j. Finish Hardware.

2. Examples of concealed surfaces not to be painted include, in part, wall or ceiling surfaces in the following generally inaccessible areas:

   a. Foundation spaces.
   b. Furred areas.
   c. Utility tunnels.
   d. Pipe spaces or chases.
   e. Duct shafts.

3. Examples of Finished metal surfaces not to be painted include, in part, the following:

   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze.
   f. Brass.
   g. Prefinished aluminum windows and trim.

4. Examples of operating parts not to be painted include, in part, moving parts of operating equipment such as the following:

   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.

5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Divisions 5 Sections, for shop priming metal work.
2. Division 6 Sections, for shop priming woodwork.

E. Where walls are indicated or otherwise required to be fire-rated and/or smokestop partitions, and at all corridor partitions, exit enclosures, and fire walls, they shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the authority having jurisdiction. Such identification shall be above any decorative ceiling and in concealed spaces. Suggested wording, "Fire and Smoke Barrier - Protect All Openings":

1. Minimum size of lettering to be 1-1/2" high.
2. Minimum of one sign or stencil at each side of each such wall.
3. Maximum spacing of signs or stenciling at each side of continuous walls to be 20'-0" on center.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Manufacturer's most current technical information, label analysis, and application instructions for each material proposed for use.

1. List each material and cross-reference to scheduled paint types, and including each specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.

C. Samples for initial color selection in the form of manufacturer's color charts from paint manufacturer intended for use.

D. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

1. Submit samples on the following substrates for the Architect's review of color and texture only: Stained or Natural Wood: Provide two 4- by 8-inch samples of natural and stained wood finish on actual wood surfaces.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by paint manufacturer, and use only within the recommended limits.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of any problems anticipated using the materials specified, prior to proceeding with work.

C. Material Quality: Provide the manufacturer's best quality grade paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude approved equivalent products of other manufacturers.

D. Color Pigments: Pure, non-fading, applicable types to suite substrates and service indicated.

E. Lead content in pigments or other painting materials and components is not allowed.

F. Solvents and V.O.C. Compliance: At the time of this writing, sufficient product data and information is not available from paint manufacturers to specify new products to replace solvent based products specified. If new regulations are in effect restricting use of solvents and/or they are not available at the time painting is required for this project, submit and provide the equivalent water-borne products to those specified, at no additional cost to the Owner.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's name, stock number, and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

C. Store materials not in use in tightly covered containers in a well- ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers, others present or passing through or inspecting work areas (painting or any other work), and the work areas themselves are protected from fire and health hazards resulting from handling, mixing, and application of materials.

D. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.6 JOB CONDITIONS:

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F, unless otherwise permitted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F and 95 deg F, unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85 percent, or at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer, during application, drying and curing periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Benjamin Moore and Co. (Moore).
2. PPG Industries, Pittsburgh Paints (Pittsburgh).
3. The Sherwin-Williams Company (S-W).
4. TNEMEC Company, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION:

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Fill cracks in wood or plywood floors with a latex filler and prime filled areas after sanding, except where otherwise recommended by paint manufacturer. Sand smooth when dried.
b. Prime, stain, or seal unfinished wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
c. When transparent finish is required, backprime with spar varnish.
d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

4. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

a. Treat bare, sandblasted, or pickled clean metal with a metal treatment wash coat before priming.
b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

D. Tinting: Tint each primer and undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat(s), but provide sufficient differences in shade of undercoats to distinguish each separate coat.

1. Finish coats as scheduled, shall be same color for each coat required.

3.3 APPLICATION:

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Use of spray equipment at the site is not allowed, except where specifically indicated.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
2. Paint surface treatments and finishes are indicated on the Drawings and in Specifications.
3. Finish colors will be selected after Bidding, unless indicated otherwise.
4. Provide finish coats that are compatible with primers used.
5. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
6. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
7. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, connector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
8. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
9. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
10. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

B. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

C. Finish doors on tops, bottoms, and side edges same as faces.

1. Sand lightly between each succeeding enamel or varnish coat.

D. Primers:

1. Omit primer on metal surfaces that have been shop-primed and touch-up painted, only after verifying full compatibility of shop primers with materials specified for the next coat and finish coats.
2. Primer may be omitted at previously painted existing surfaces in good condition, except at interior concrete, plaster and drywall surfaces, after repairs to any existing damaged substrates and after spot priming of existing damaged paint finish, followed by cleaning and preparation recommended in writing by paint manufacturer.

E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under

moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

F. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

G. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

1. Mechanical items to be painted include but are not limited to:

a. Piping, pipe hangers, and supports.
b. Tanks.
c. Ductwork.
d. Insulation.
e. Supports.
f. Accessory items.

2. Electrical items to be painted include but are not limited to:

a. Conduit and fittings.
b. Switchgear.

H. Block Fillers: Apply block fillers to new or previously unpainted concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before application of finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 CLEANING:

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION:

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE:

A. General: Provide the following paint systems for the various substrates indicated. (Abbreviations Note: ct = coat; cts = coats)

P-1: IRON AND STEEL SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
   b. Finish (2cts): Sher-Cryl HPA High Performance Acrylic (Gloss, B66-300 or Semi-Gloss, B66-350)

P-2: GALVANIZED STEEL AND ALUMINUM SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
   b. Finish (2cts): Sher-Cryl HPA High Performance Acrylic, (Gloss, B66-300 or Semi-Gloss, B66-350)

P-3: PAINTED STUCCO, AND CONCRETE SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Loxon Concrete & Masonry Primer, A24W8300; Brush and Roller application only.
   b. Finish (2cts): A-100 Exterior Latex Flat House Paint, A6 Series; Brush and Roller application only.

P-4: CMU AND MASONRY SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): PrepRite Interior / Exterior Block Filler, B25W25; Brush and Roller application only.
   b. Finish (2cts): A-100 Exterior Latex Satin House Paint, A82 Series Brush and Roller application only.
   c. All block pores shall be completely filled.

P-5: PAINTED WOOD SURFACES - (Opaque Finish):

1. Sherwin-Williams:
   a. Primer (1ct): Exterior Latex Wood Primer, A24W8041;
      Option: Exterior Alkyd Wood Primer, Y24W8020
   b. Finish (2cts): A-100 Exterior Latex Gloss House Paint, A8 Series

P-6: PAINTED PLYWOOD SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Exterior Latex Wood Primer, A24W8041
   b. Finish (2cts): A-100 Exterior Latex Gloss House Paint, A8 Series

3.7 INTERIOR PAINT SCHEDULE:

A. General: Provide the following paint systems for the various substrates, as indicated.

P-7: IRON AND STEEL SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
   b. Finish (2cts): Pro Industrial 0 VOC Acrylic, B66-600 Series
      (Gloss, B66-600 Series / Semi-Gloss, B66-650 Series)

P-8: GALVANIZED STEEL AND ALUMINUM SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Pro Industrial Pro-Cryl Universal Primer, B66-310
   b. Finish (2cts): Pro Industrial 0 VOC Acrylic, B66-600 Series
      (Gloss, B66-600 Series / Semi-Gloss, B66-650 Series)

P-9: PLASTER AND CONCRETE SURFACES:

1. Sherwin-Williams:
   a. Primer (1ct): Loxon Concrete & Masonry Primer, A24W8300
   b. Finish (2cts): ProMar 200 Zero VOC Interior Latex Egg-Shell, B20-2600

P-10: WOOD SURFACES TO BE PAINTED (OPAQUE FINISH):

1. Sherwin-Williams:
   a. Primer (1ct): Premium Wall & Wood Primer, B28W8111
   b. Finish (2cts): ProMar 200 Zero VOC Interior Latex S/G, B31-2600;
      Option: ProMar 200 WB Acrylic-Alkyd S/G, B34-8251

P-11: WOOD SURFACES TO RECEIVE NATURAL FINISH (STAINED):

1. Sherwin-Williams:
   a. First Coat: Alkyd Interior Paste Wood Filler, fully compatible with other finish system products below.
   b. Second Coat: WoodClassics “250” Interior Oil Stain, A49-800
   c. Third Coat: WoodClassics WB Polyurethane, A68 Series
   d. Fourth Coat: WoodClassics WB Polyurethane, A68 Series

(Satin, A68F90 – Gloss, A68V91)

d. Fifth Coat: WoodClassics WB Polyurethane, A68 Series (Satin, A68F90 – Gloss, A68V91)

2 Natural finish (stained) shall be typical finish, unless indicated otherwise, for:

a. New wood doors, unless specifically indicated otherwise.
b. Elsewhere as indicated on the Drawings.

P-12: DRYWALL SURFACES - (Dry Areas):

1. Sherwin-Williams:
   a. Primer (1ct): HB Interior Latex Primer/Surfacer, B28W08601; Approximately 20-mil dry thickness; <This primer only, spray-applied>.

      Number of coats as required to conceal minor wall irregularities, imperfections, differing textures, joint taping and mudding, etc., prior to finish coats.

   b. Finish (2cts): ProMar 200 Zero VOC Interior Latex Egg-Shell, B20-2600

P-13: DRYWALL SURFACES - (Wet Areas: Toilet, Locker, Shower & Janitors Rooms, Kitchen Areas, any room with a plumbing fixture, and areas where food is stored, prepared, cooked and/or served):

1. Sherwin-Williams:
   a. Primer (1ct): HB Interior Latex Primer/Surfacer, B28W08601; Approximately 20-mil dry thickness; <This primer only, spray-applied> Number of coats as required to conceal minor wall irregularities, imperfections, differing textures, joint taping and mudding, etc., prior to Second Primer and finish coats.

   b. Finish (3cts): Waterbased Catalyzed Epoxy, B70W211 (Semi-Gloss, B60V25 – Gloss, B60V15)

P-14: CMU AND BRICK SURFACES - (Dry Areas):

1. Sherwin-Williams:
   a. Primer (1ct): PrepRite Interior / Exterior Block Filler, B25W25; Brush and Roller application only.
   b. Finish (2cts): ProMar 200 Zero VOC Interior Latex S/G, B31-2600; Brush and Roller application only.
   c. All block pores shall be completely filled.

P-15: CMU AND BRICK SURFACES - (Wet Areas: Toilet, Locker, Shower & Janitors Rooms, Kitchen Areas, any room with a plumbing fixture, and areas where food is stored, prepared, cooked and/or served):

1. Sherwin-Williams
   a. Primer (1ct): Heavy Duty Block Filler, B42W46; Brush and Roller application only.

Option: Cement-Plex 875 Epoxy Block Filler, B42W200; Brush and Roller application only.

b. Finish (2cts): Pro Industrial Zero VOC WB Catalyzed Epoxy, B73-300 Series; Brush and Roller application only.

c. All block pores shall be completely filled.

END OF PAINTING

SECTION 10100

VISUAL DISPLAY BOARDS

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. Related work specified elsewhere includes:

1. Section 04200 - "Unit Masonry"
2. Section 06100 - "Rough Carpentry" (concealed P.T. 2 x 10 wood blocking at anchorage)
3. Section 09250 - "Gypsum Drywall"

1.2 SUMMARY:

A. This Section includes the following types of factory-built visual display boards; Colors as selected.

1. Porcelain Enamel Steel Finish Markerboards.
2. Natural cork tackboards.

B. All markerboards and tackboards shall be 4'-0" in height by lengths indicated on the Drawings.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1. Product Data: Include manufacturer's data substantiating that visual display board materials comply with requirements indicated.
2. Shop Drawings: Provide shop drawings for each type of markerboard and tackboard unit required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
3. Samples: Provide the following samples of each product for selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.

   a. Markerboards: Manufacturer's standard color charts consisting of actual sections of markerboard material and finish required, and where colors are not pre-selected, also showing the full range of colors available for each type of markerboard required.
   b. Tackboards: Manufacturer's standard color charts consisting of actual sections of tackboard material and finish required, and where colors are not pre-selected, also showing the full range of colors, textures, and patterns available for each type of cork tackboard indicated.
   c. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate, showing the full range of colors available, or pre-selected colors. Where

finishes involve normal finish, texture, and/or color variations, include sets showing the full range of variations expected.

B. Certificates: In lieu of laboratory test reports, when permitted by the Architect, submit the manufacturer's certification that product materials furnished comply with requirements specified for flame spread ratings.

C. Warranty: Provide manufacturer's sample warranty for each product proposed to be furnished. Upon acceptance, furnish actual executed warranty to the Contractor for submittal with Project Closeout Documents.

1.4 QUALITY ASSURANCE:

A. Fire Performance Characteristics: Provide tackboards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 10 or less.

B. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the specific type and model indicated.

1. Substitutions: Other visual display boards having equivalent performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.
2. Refer to Section 01015 – "Special Conditions", for requirements and time limits for submitting requests for substitutions.

C. Toxin-Free: Provide tackboard and markerboard products and assemblies which are free of any toxins, asbestos, harmful by-products, and carcinogens, including in part, all adhesives and glues.

1. Tackboards shall be in compliance with Military Specification MIL-C-15116-C, Type II.

D. Single Source Responsibility: Provide all markerboards, tackboards, trim, and accessories by one manufacturer for the entire project, unless otherwise accepted by Architect in writing.

1.5 PROJECT CONDITIONS:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting; Coordinate with the work of other trades. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

1.6 WARRANTY:

A. Provide manufacturer's standard written warranty for each markerboard and tackboard product furnished.

B. Warranties shall be in addition to and shall run concurrently with any other warranties required by this project's Contract Documents, and shall not serve as any limitations of the rights of the Owner within the provisions of the Contract Documents or otherwise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS/PRODUCTS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Porcelain Enamel Steel Finish Markerboards:

   a. American Visual Display Products; Wetumpka, AL
   b. Best-Rite Chalkboard Co.
   c. Carolina Chalkboard Co.
   d. Claridge Products and Equipment, Inc.
   e. Greensteel, Inc.
   f. Lemco, Inc.
   g. Marsh Chalkboard Co.
   h. Nelson Adams Co.
   i. Newline Products, Inc.
   j. Polyvision Corporation

2. Tackboards:

   a. American Visual Display Products; Wetumpka, AL
   b. Best-Rite Chalkboard Co.
   c. Carolina Chalkboard Co.
   d. Claridge Products and Equipment, Inc.
   e. Greensteel, Inc.
   f. Lemco, Inc.
   g. Marsh Chalkboard Co.
   h. Nelson Adams Co.
   i. Newline Products, Inc.
   j. Polyvision Corporation

B. Products: Subject to compliance with requirements, provide equivalent to the following products by one of the above named manufacturers.

1. Porcelain Enamel Steel Finish Markerboards (24-gage; color as selected):

   a. Equivalent to Claridge Products and Equipment, Inc.; "LCS."

2. Tackboards (color as selected):

    a. Equivalent to Claridge Products and Equipment, Inc.; "Tan Nucork."

3. Aluminum Trim and Accessories (color as selected):

    a. Equivalent to Claridge Products and Equipment, Inc.; "Series 1."

4. Equivalent Products by those manufacturers named above, and/or other manufacturers properly submitted (refer to Section 01015 – "Special Conditions") at least 10 days prior to Bid Date and subsequently accepted by Architect in writing or by Addendum will be acceptable.
5. Colors: As selected by Architect.

2.2 MATERIALS:

A. Tackboard Core: Provide the manufacturer's standard 1/4-inch-thick tempered hardboard core material.

B. Markerboard Core: Provide the manufacturer's standard 1/2-inch thick particle board material.

C. Backing Sheet: Provide the manufacturer's standard 0.005-inch thick aluminum foil backing.

D. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.

E. Porcelain Enamel Steel Finish Markerboards: Provide 1/2-inch-thick particle board panel surfaced with the manufacturer's 24-gage steel sheet and porcelain enamel finish formulated for matte marker-receptive finish and for use of magnetic devices.

    1. Provide with 0.005-inch thick aluminum foil backing.

F. Natural Cork Tackboards: Provide single-layer, 1/4-inch-thick, seamless, compressed fine-grain bulletin board quality natural cork sheet, face sanded for natural finish, complying with MS MIL-C-15116, Type II.

    1. Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4-inch-thick hardboard backing.

        a. Where available, provide with 0.005-inch thick aluminum foil backing.

G. Hardwood Plywood: HPVA HP-1**, made with adhesive containing no urea formaldehyde**.

H. Vinyl Fabric: FS CCC-W-408D, Type II, weighing not less than 13 oz./sq. yd. (440 g/sq. m); with flame-spread index of 25 or less when tested according to ASTM E 84.

I. Extruded-Aluminum Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063.

J. Aluminum Tubing: ASTM B 429, Alloy 6063.

2.3 TACK AND MARKERBOARD ACCESSORIES:

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.

B. Marker/Chalk Tray: Furnish manufacturer's standard continuous box-type aluminum marker/chalk tray with slanted front and cast aluminum end closures for each markerboard.

C. Map Rail at Markerboards: Furnish continuous map rail at the top of each markerboard unit, complete with the following accessories:

1. Display Rail: Provide continuous cork display rail approximately 1-inch wide, integral with the map rail.
2. End Stops: Provide one end stop at each end of the map rail.
3. Map Hooks: Provide two metal map hooks with flexible metal clips for each three feet of map rail or fraction thereof.
4. Flag Holder: Provide one flag holder in each classroom, at location as directed.

2.4 TACK AND MARKERBOARD FABRICATION:

A. Assembly: Provide factory-assembled markerboard and tackboard units, except where field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
2. Provide manufacturer's standard mullion trim at joints between contiguous markerboard and tackboard.

2.5 FINISHES:

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

1. Provide color anodized in lieu of clear, upon request by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper backing for tack and marker boards.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Deliver factory-built markerboard and tackboard units, completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

1. Mounting Height: Top of markerboard and tackboard units, shall align and be at 7'-0" above finished floor, unless otherwise indicated.

a. Grades K through 3: Top of markerboard and tackboard units shall align and be located 6'-0" above finished floor; **Verify with Owner prior to installation.**

3.2 ADJUST AND CLEAN:

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units in accordance with the manufacturer's instructions. Break in markerboards only if and as recommended by the manufacturer.

END OF VISUAL DISPLAY BOARDS

SECTION 10165

TOILET PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Concealed preservative treated (P.T.) 2x wood blocking for anchorage within stud walls is specified in Division 6 Section "Rough Carpentry".

B. Toilet accessories are indicated on the Drawings and specified in Division 10 Section "Toilet and Bath Accessories".

1.2 DESCRIPTION OF WORK:

A. Extent of toilet partitions is indicated on drawings.

B. Types of toilet compartments include stainless steel, floor anchored, overhead braced toilet partitions and screens.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's current detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

C. Samples: Submit full range of physical color samples for each type of unit required.

D. Product Certificates: For each type of toilet compartment, from manufacturer.

E. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and

Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.5 WARRANTY:

A. General: Warranties shall run concurrently with, be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents or otherwise.

B. Partition Manufacturer's Warranty:

1. Submit written agreement on manufacturer's standard form signed by Manufacturer, agreeing to repair or replace defective workmanship and construction, or assemblies which do not conform to tolerance limitations of referenced quality standards and specifications, under normal wear and use, and when properly maintained.
2. Warranty shall include replacement and reinstallation which may be required due to repair or replacement of defective workmanship and construction.
3. Warranty shall be in effect during following period to time after date of project Substantial Completion.

    a. Toilet Partitions Furnished Under This Section: **10 years**.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Accurate Partitions Corp.
2. All American Metal Corp. (*Basis of Design, quality and warranty*)
3. American Sanitary Partition Corp.
4. Ampco Products Inc.
5. Bobrick Washroom Equipment Co.
6. Mills Partitions; Div. of Bradley Corp.
7. Flush-Metal Partition Corp.
7. General Partitions Mfg. Corp.
8. Global Steel Products Corp.
9. Hadrian Manufacturing Inc
10. Knickerbocker Partition Corp.
10. Metpar Corp.
11. Sanymetal Products Co.; a Crane Plumbing company

B. Product/Manufacturer: Provide equivalent to Type H/B (headrail braced) Stainless Steel Overhead Braced partitions with "Institutional Hardware" option in satin finished stainless steel, including in part, continuous piano hinge at door, continuous double angle, channel, and double-angle-channel anchorages of panels to walls and standards (pilasters), and other standard and indicated additional items, as manufactured by All American Metal Corporation; Freeport, NY; by one of the above named manufacturers.

2.2 MATERIALS:

A. General: Provide materials which have been selected for surface flatness and smoothness, Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

B. Stainless Steel: NEMA Std. LD-3, minimum 0.062-inch thick, color and pattern as indicated or, if not indicated, as selected by Architect from manufacturer's standards.

C. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

C. Stainless-Steel Castings: ASTM A 743/A 743M.

D. Zamac: ASTM B 86, commercial zinc-alloy die castings.

F. Pilaster Shoes: ASTM A 167, Type 302/304 stainless steel, not less than 3-inches high and 20 gage, finished to match hardware.

G. Stirrup Brackets: Manufacturer's standard design for attaching panels to floors; stainless steel.

H. Channel, Angle, and Double-Angle-Channel Brackets: Manufacturer's standard satin stainless steel units, predrilled for fasteners, and designed for continuous anchorage of panels to walls and pilasters. Limit exposed angle flanges to interior of stalls where possible, and where permanence of installation will not be reduced or otherwise affected.

I. Hardware and Accessories: Manufacturer's standard "Institutional" design, heavy- duty operating hardware and accessories of chromium plated stainless steel.

1. Continuous Hinges: Manufacturer's standard satin stainless steel units, predrilled for fasteners, and designed for continuous anchorage of door panels to pilasters, and which close doors to the extent of allowing doors to stand partially open when stalls are unoccupied.

J. Overhead-Bracing: Continuous extruded aluminum tubing in anti-grip profile, with clear anodized finish. Provide concealed anchorage where possible, with concealed anchorage blocks, and exposed ends neatly closed with either matching end cap and/or filler.

K. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium plated steel, or brass, finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium- plated, or other rust-resistant protective-coated steel.

2.3 FABRICATION:

A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts (if any), drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars as indicated.

B. Door Dimensions: Unless otherwise indicated, furnish 28-inches wide inswinging doors for ordinary toilet stalls and 32-inches wide (clear opening) outswinging doors at stalls equipped for use by handicapped.

C. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated under pressure to a sound deadening double-faced honeycomb core material; with continuous, interlocking stainless steel roll-formed edge molding; all mitered corners shall be secured by welding and exposed welds ground smooth.

1. Doors: 1" thick, constructed with two **22-gauge** sheets of stretcher leveled type 304 stainless steel #4 finish.
2. Panels: 1" thick, constructed with two **22-gauge** sheets of stretcher leveled type 304 stainless steel #4 finish.
3. Pilasters: 1-1/4" thick, constructed with two **20-gauge** sheets of stretcher-leveled type 304 stainless steel #4 finish.

D. Overhead-Braced Partitions: Furnish stainless steel or galvanized steel supports and leveling bolts at pilasters, as recommended in writing by manufacturer to suit floor conditions. Make provisions for setting and securing continuous aluminum overhead bracing tube at top of each pilaster and back to wall at ends and at urinal screens. Furnish shoe at each pilaster to conceal supports and leveling mechanisms.

E. Floor-Supported Screens Overhead-Braced Partitions: Furnish in-line pilasters not less than 1-inch in thickness, panels and pilasters of same construction and finish as toilet partitions. Furnish galvanized steel anchorage devices, complete with threaded rods, lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at each pilaster to conceal anchorage.

1. Furnish wall anchors and overhead bracing same as specified for toilet partitions.

F. Hardware: Furnish hardware for each compartment in partition system, as follows:

1. Continuous Hinges: Manufacturer's standard satin stainless steel "Institutional" units, predrilled for fasteners, and designed for continuous anchorage of door panels to pilasters.
2. Latch and Keeper: Manufacturer's standard "Institutional" surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper(s).
3. Combination Bumper and Coat Hook (typical): Manufacturer's standard unit, combination hook and non-marring rubber-tipped bumper.

    a. In addition, provide wall bumper at out swinging doors.
    b. In addition, provide standard square-faced satin stainless steel coat hook from "commercial hardware" group, at interior of each door.

4. Door Pull: Manufacturer's standard "Institutional" unit.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Comply with manufacturer's current written instructions and recommendations for procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide concealed clearances of not more than 1/4-inch between pilasters and panels, and not more than 1/2-inch between panels and walls (concealed by angle and channel mounting supports). Secure panels to walls with continuous stainless steel channels, double angles, and double-angle-channel supports, as appropriate for the location being anchored, with angle flanges limited to interior of stalls where possible. Secure panels to pilasters with continuous stainless steel channels, double angles, and double-angle-channel supports, as appropriate for the location being anchored, with angle flanges limited to interior of stalls where possible. Align with mounting supports at walls. Secure panels in position with anchoring devices recommended in writing by manufacturer.

B. Overhead-Braced Partitions: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead brace when doors are in closed position.

1. Provide and install additional overhead bracing at exposed sides of panel installations, anchored securely to pilaster at front and directly above side panel to wall at rear of stall.

C. Screens: Attach with concealed anchoring devices, as recommended in writing by manufacturer to suit supporting wall structure and floor. Set units to provide support and to resist lateral impact. Anchor to floor and wall, and provide overhead bracing same as for overhead-braced partitions.

1. **Pilasters shall be in-line with panel**, so as not to encroach on clear access to fixture(s) being screened.

3.2 ADJUST AND CLEAN:

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF TOILET PARTITIONS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 10800

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 04200 - "Unit Masonry"
2. Section 06200 - "Rough Carpentry"
3. Section 10165 - "Toilet Partitions"

1.2 SUMMARY:

A. The extent of toilet and other accessory items is indicated on the Drawings, in this Section 10800, and as follows:

1. Ligature-Resistant Toilet Tissue Holder.
2. Ligature-Resistant Grab bars.
3. Security Mirrors.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

1. Product Data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gauges, profiles, method of mounting, specified options, and finishes.
2. Setting Drawings: Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

1.4 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS:

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following and which are equivalent to the units specified:

1. Willoughby, Inc.
2. Acorn, Inc.
3. American Specialties, Inc. (ASI)
4. Bobrick Washroom Equipment, Inc.
5. Bradley Corporation.
6. Kingsway Group USA.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gauge (.034-inch) minimum thickness, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16, Castings, ASTM B-30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gauge (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 LIGATURE RESISTANT TOILET TISSUE HOLDER:

A. Stainless Steel Type: Provide 316 grade stainless steel, designed to provide a wall-mounted single-roll holder while maintaining ligature-resistance in security and behavioral environments.

B.

1. Mounting: Manufacturer's standard flanges and anchorages, secured by four stainless steel vandal-resistant set screws.
3. Locations, Size, and Configurations: As indicated on the Drawings.

B. Manufacturer/Series No.:

1. Equivalent to Kingsway Group KG03 Series.

D. Mounting Height:

1. Refer to Drawings.

2.4 LIGATURE RESISTANT GRAB BARS:

A. Stainless Steel Type: Provide fabricated 14 gauge, Type 304 stainless steel accessories, designed to provide a wall-mounted gripping surface while maintaining ligature-resistance in security and behavioral environments.

B.

1. Mounting: Manufacturer's standard flanges and anchorages, secured by four stainless steel vandal-resistant set screws.
2. Gripping Surfaces: Manufacturer's standard nonslip texture.
3. Locations, Size, and Configurations: As indicated on the Drawings.

C. Manufacturer/Series No. - Straight Bars:

1. Equivalent to Willoughby ASGB Series.

D. Mounting Height:

1. Refer to Drawings.

2.5 SECURITY MIRROR UNITS:

A. Stainless Steel Mirror Units: Mirror and integral frame are die formed from a single sheet of type 400 stainless steel polished to a mirror finish.

B. Frame to have countersunk holes and furnished with 1/4"-20 x 1" long tamper-resistant screws.

C. Manufacturer/Model No.

1. Equivalent to Acorn Model 1817-A Series.
2. Size: 11-1/4" by 17-1/4".

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install toilet accessory units in accordance with manufacturers' current written instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper proof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

3.2 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF TOILET AND BATH ACCESSORIES

SECTION 11195

SECURITY FENCING

PART 1 - GENERAL

1.1 GENERAL:

A. The work in this section shall consist of furnishing and installation of a complete fence system, with all appurtenances and hardware necessary for a functional unit. The area shall be a totally enclosed cage; and shall be a 12-foot fence. Furnish and install a 6-foot fence around any condensing units located inside the detention area.

B. All material and installation meet the standards of the "Chain Link Fence Manufacturers Institute" unless specific deviation is given on the drawings or herein.

C. Complete shop drawings shall be submitted (see Div. 1) which shall include a list of all materials i.e., clamps, fasteners, wire cloth, poles, caps, outrigger arms, concrete bond beam details, gates, hinges, barb wire attachment, tire wire, etc.

1.2 APPLICABLE PUBLICATIONS:

A. ASTM F552 – Standard Definitions of Terms Relating to Chain Link Fencing

B. ASTM F567 – Installation of Chain Link Fencing

C. ASTM 8117 – Salt Spray (Fog) Testing

D. ASMT 86 – Zinc (Slab Zinc)

E. ASTM A153 – Zinc Coating (Hot Dip) on Iron and Steel Hardware

F. ASTM A36 – Structural Steel

PART 2 - PRODUCTS

2.1 FENCE SYSTEM

A. The fence system shall be a single fence; the fence shall be 12 feet high with double outriggers for barbed wire and razor ribbon. Install 2'-0" in ground with trench filled with concrete. This 2'-0" is in addition to the 12'-0" above ground.

2.2 CHAIN LINK FABRIC

A. Shall be a minimum 2 percent copper bearing-basic open hearth steel sire, 9 gauge with 2" mesh. Top and bottom selvage shall be twisted and barbed at all fences. The intermediate horizontal joining of the 12 foot fabric shall be knuckled. The fabric shall be hot-dip coated with aluminum before weaving to product an aluminum coating of not less in weight than 0.40 oz. per square foot in accordance with ASTM A428 and ASTM A491. Wire in completed fabric shall be capable of withstanding tensile strength test of 85,000 PSI and meeting ASTM A392, Class II.

2.3 BARBED WIRE

A. The wire shall be aluminum coated double strand. 12.5 gauge twisted wire with 14 GA, 4 point round aluminum barbs spaced on approximately 5" centers conforming to ASTM A585.

2.4 TENSION WIRE

A. Coiled spring wire, hot-dip coated with aluminum of not less in weight than 0.40 oz. per square foot of uncoated wire surface – 7 gauge shall be furnished and installed on the top of the fence.

2.5 CHAIN LINK FENCE POST, GATE FRAMES, BRACES AND RAILS

A. Shall be tubular section and Schedule 40 steel pipe in accordance with ASTM A120, Type 1, and shall be hot-dip galvanized 2.0 oz. minimum per square foot.

B. End, Corner and Pull Posts: Four inch OD pipe, Schedule 40.

C. Line Posts: 2.875 inch OD, Schedule 40, SS40 pipe

D. Gate Support Posts:

1. Provide four inch OD pipe for swinging gates up to 8 feet wide by 12 feet high, 8 feet wide by 8 feet high, with 8 foot transom.

2. Provide 6.625 inch OD pipe for swinging gates 10 feet wide by 12 feet high, 14 feet wide by 12 feet high with barbed tape obstacle secure to top of fabric at 9 inches OC and fastened to outriggers.

E. Bottom and Intermediate Horizontal Rails for Fencing: 1.66 OD Schedule 40 or SS40 Pipe, or 1.625 inch by 1.25 inch channel section; and intermediate horizontal rails for Gate, and Diagonal Gate Bracing: 1.66 inch OF pipe.

F. Diagonal Cross Bracing: 3/8" diameter adjustable length truss rods. Proved at end, corner and pull posts and where necessary at gates to create a rigid frame and prevent sag or twist.

G. Gate Frames: Fabricated perimeter of pipe and channels as indicated and provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, accessories, electro-mechanical locks and operators. Assemble by welding or fittings and rivets for rigid connections. Attach hardware using rivets or other devices which will provide security against removal or breakage. Provide 5/16" 3+/- inch plates, seal welded continuous on both sides, at bottom pipe and channel of sliding gate frames, drill ¼" diameter holes at 24 inches OC, adjacent to the welded intersection of the pipe for securement of fabric to sliding gate with pipe frame, and hot-dip galvanized pipe and channel types, after fabrication.

1. Perimeter Swing Type Gates:
   a. Horizontal, 1.90 inch OD pipe
   b. Vertical, 1.90 inch OD pipe

H. Gate Hardware (GH-1) and Accessories:

1. Perimeter Swinging Gates: Each shall have:

a. Hinges: Malleable iron non-lift-off type, offset (to permit 90 degree swing); to suite 8 foot x 8 foot thru 14 foot x 16 foot gate leaf sizes. Provide 1- ½ pair for each gate.

b. Provide AST, A36 steel plate sections, cut to radius shown with welded stud or hood type anchors at 12 inches on center, staggered as indicated.

c. Provide bearing type bottom roller assembly, complete with pressure type grease fittings, as indicated.

d. Balance of hardware to include, but not limited to, neoprene bumpers and steel stops, shall be provided under the work of this section as required for a complete functioning installation.

e. All gates shall be furnished with heavy duty padlocks; all keyed alike. Furnish at least three (3) keys; one for each key cabinet.

2.6 BARBED TAPE OBSTACLE:

A. Shall be spring quality austenitic stainless, 0.25 inches thick by 1 – 1/4" wide by 30 inches diameter with 18 clusters of four – 1" long razer type barbs cut at four inches OC throughout the helix, in accordance with Barbed Tape Obstacle Super Maze (cell with wire). The concertina loop spacing shall be 7"=2" at coil length at 25'. The coil core wire shall be stainless steel 0.098 inch diameter high tensile wire. Attach tension wires and every third barb of fabric at nine inches maximum OC, attach on 45 degree arm, and on top of outer perimeter fence and swinging gate and on top of outer perimeter sliding gate type "J" operator track box housing, with galvanized vandal – proof metal strap or wire clips and double loop 16 gauge galvanized attachment ties. Barbed tape obstacle shall be hinged at swinging gate pivot support post. One coil of barbed tape obstacle super maze on ground at the outer perimeter fence on the interior side. The above as manufactured by American Tube Co., or American Security Fence Corporation.

2.7 FITTINGS AND ACCESSORIES:

A. Shall be Malleable iron or steel, hot-dip galvanized.

B. Cap posts to exclude moisture from tubular sections.

C. Extension Support Outrigger Arms: Steel arms complete with malleable iron bases, hot-dip galvanized, 15 inches long, with provisions at end of arm to secure tension wire. Arms shall be of sufficient strength to withstand a weight of 250 pounds applied at the end of projection and shall be specifically made to hold barbed wire.

D. Thread stretcher bars through fabric using one bar for each grate and end post, and two of each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2" when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced no farther than 15 OC. Fasten the fabric to the steel framework with 9 gauge steel wire ties spaced no farther apart than 12" OC for all posts, rails, braces, and tension wires. Tighten stretcher bar bands, wire ties and any other fasteners securely. Fabric should not be free to move along any of the framework.

E. Tension Stretcher Bar Bands: 0.78" by ¾" flat or beveled steel for attaching fabric and tension stretcher bars to gate and pull posts at 15 inches maximum OC. Attachment bolts shall be 5/16" by 1 ¼" galvanized carriage bolts and nuts.

F. Tire Wire: For tying fabric to rails at 24 inches maximum OC and posts at 15 inches maximum OC, 9 gauge galvanized steel wire. For tying bottom fabric to continuous concrete ribbon wall and visitors area retaining wall. #9 Awg stainless steel hairpin shape or government type anchors at 24 inches maximum OC.

G. Hog Ring Staples: For tying fabric and fabric to tension wire, hot-dip galvanized - #11, at 15 inches maximum OC.

2.8 ZINC COATING:

A. All ferrous metal used in the construction of the fences and gates shall be hot-dip zinc coated after fabrication with not less than 2 ounces of zinc in accordance with ASTM 8-6, per square foot of actual surface, as determined in accordance with tests set forth in ASTM A90. Repair galvanized after welding with a galvanized repair coating such as "Falvaneal", "Galvicon", "Z.R.C.", or equivalent.

2.9 CONCRETE FOOTINGS:

A. See fence drawings for size of concrete footing for posts. Top of exterior concrete footing shall be rounded to shed water.

2.10 CONCRETE:

A. Concrete shall be normal weight concrete, unless otherwise indicated with 3000 psi minimum compressible strength at 28 days in accordance with ACI – 301. Comply in all respects with Section 03310. Concrete work using concrete mix for foundations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install chain link fences and gates per manufacturer's published instructions, in accordance with ASTM F567 by a manufacturer's licensed representative, and as follows:

1. Do not begin prior to establishment of final grades. Examine conditions under which fence and gates are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in acceptable manner.

2. The finished fence shall conform to the alignment indicated, and shall conform to the general grade of the existing terrain when the grade for the fence is not established.

3. Space posts not more than eight feet OC and no more than five feet OC where changes in direction of ten degrees or more horizontally or vertically occur. Dig or drill holes for exterior post footings in firm, undisturbed or compacted soil. Excavate hole depths to 2 feet minimum and a minimum of three inches lower than the post bottom. Excavate deeper for adequate support in soft and loose soil, and for posts in a continuous pour and tamp to consolidate. Check posts for vertical and top alignment; brace during placement and

finishing operations. Install braces so that posts are plumb when diagonal rod is under proper tension. Set accessories into concrete specified above.

a. Interior fence post footings must be core-drilled into the existing concrete slab and filled flush with new concrete or fastened to existing concrete with metal plates fastened to the existing slab with bolts.

4. Chain link fabric shall be placed on the inmate side of posts and gates. Stretch taut, smooth, uniform and free from sag, between one inch to two inches above ground level. Join rolls of wire by weaving a single strand into ends of rolls to form continuous mesh between terminal posts. Cut fabric at terminal posts so that each span is attached independently at terminal posts. Where two fabrics are required for the 12 foot perimeter fence, fabrics shall be joined horizontally with hog ring staples at maximum 15 inch intervals.

a. Fasten fabric to terminal posts and vertical gate framing with stretcher bar and stretcher bar bands spaced at maximum 15 inch intervals.

b. Fasten fabric line posts and intermediate vertical gate framing with tie wire attached at maximum 12 inch intervals.

c. Fasten fabric to intermediate horizontal rails and horizontal and diagonal gate rails and bracing at maximum 24 inch intervals.

d. Fasten fabric and hardware cloth to support arm, top, bottom, and intermediate tension wires with hog ring staples at maximum 15 inch intervals.

e. Fasten fabric to the top of the gates and the bottom of gates and transom rails with vandal proof wire clips at maximum 15 inch centers.

f. Fasten fabric to barbed tape obstacle with double loop attachment ties at every third barb of fabric or maximum 9 inch centers and at tension wire at ends of arms.

g. Fabric shall remain in tension after pulling force is released.

B. Connections at building shall be made at the locations indicated on the drawings, to provide a finished installation. All necessary cutting, fasteners, and materials to make the connections shall be provided. Space between pipe and building shall not exceed one inch.

C. Brace terminal posts with intermediate horizontal rails at midpoint above grade and secure diagonal braces to the terminal post and adjacent linepost or its footing at maximum of 50 degree angle between the diagonal brace and grade.

D. Install gates plumb, level and secure for full opening without interference. Install ground set items in concrete. Hang swing in hinges so they will remain motionless in any position. Adjust hardware for smooth operation and lubricate where necessary.

E. Install concrete individual footings in accordance with ACI-301 and Section 03310 – Concrete Work, except as modified herein.

1. Placing of concrete under water is not permitted.

F. Clean Up:

1. Clean up work of all debris and surplus materials upon completion of the fences, gates, and associated work.

G. Operation:

1. Schedule demonstration of proper operation of gates with Architect and Owner.

END OF SECTION 11191

SECTION 13122

PRE-ENGINEERED METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 03310 - "Concrete"
2. Section 04200 - "Unit Masonry"
3. Section 05500 - "Metal Fabrications"
4. Section 06100 - "Rough Carpentry"
5. Section 07600 - "Flashing and Sheet Metal"
6. Section 07900 - "Joint Sealers"
7. Section 08110 - "Steel Doors and Frames"
8. Section 09250 - "Gypsum Drywall"

1.2 SUMMARY:

A. This Section includes a single-story, multi-span, rigid-frame-type **with tapered columns**, clear span, insulated, pre-engineered metal building system frame, of the nominal length, width, eave height, and roof pitch, as indicated on the Drawings.

1. Exterior walls are masonry in combination with horizontal and vertical metal profile wall panels over waterproofing underlayment(s) indicated over sheathing indicated, supported on wall framing and/or stud walls at exterior, and combination of masonry, metal siding/liner panels, plywood and/or gypsum board at interior, specified in other sections, unless specifically indicated otherwise, and all related work. Metal building soffit panel system, where indicated only for soffit(s) of metal building.
2. Roof System consists of the manufacturer's standard standing-seam, **machine-seamed**, insulated roof, and trim, with gutters and downspouts, soffits, special finished ceiling and fall-protection/insulation support system below and concealing roof purlins and framing ("Simple Saver System"), etc., and all related work.
3. Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. General: Engineer, design, fabricate and erect the pre-engineered metal building system to withstand loads from winds, gravity, structural movement including movement thermally induced, and to resist in-service use conditions that the building will experience, including exposure to the weather, without failure.

1. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual."
2. Provide grounding system for lightening protection, in compliance with building manufacturer's recommendations.

B. Design Loads: Basic design loads, as well as auxiliary and collateral loads, are indicated on the drawings, and shall in addition be as required by project conditions.

1. Basic design loads include live load, and wind load, in addition to the dead load.
2. The Owner has indicated that auxiliary loads including dynamic live loads such as those generated by cranes and material handling equipment, will not be added to the structure under this Contract or in the future.
3. Collateral loads shall include additional dead loads over and above the weight of the metal building system, such as roof-mounted and suspended mechanical systems, gymnasium equipment, finished ceilings, sprinkler piping, light fixtures, conduits, ductwork, piping, equipment, overhead doors, etc.
4. All frames shall be designed to limit lateral drift per Drawings.
5. Minimum wind speed / load at the project site is **120 mph**, unless a greater wind load is indicated on Structural Drawings, or otherwise required by applicable codes and/or authorities having jurisdiction.
6. Minimum uniform pressure of **20 psf**, acting inward or outward.

C. Structural Framing, and Roofing and Siding / Wall Construction: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual," in accordance with notes and requirements on Structural Drawings, and the following. Where a conflict in requirements may occur, the more stringent requirements shall apply. Comply with requirements for **U.L. Class 120 wind uplift rating**, minimum.

1. AISC "Code of Standard Practice for Steel Buildings and Bridges":

    a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."

2. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses, including the "Commentary" and Supplements thereto, as issued.
3. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
4. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures, and AWS D1.1 "Structural Welding Code."
5. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product data consisting of metal building system manufacturer's product information for building components and accessories.

C. Shop drawings prepared by or under the supervision of a registered Professional Engineer experienced in the design of pre-engineered metal buildings and currently registered in the State of Alabama, for metal building structural framing system, any roofing and siding panels, and other metal building system components and accessories that are not fully detailed or dimensioned in manufacturer's product data. The responsible design engineer shall place their signed and dated Alabama seal on all Shop Drawings.

1. Structural Framing: Furnish complete erection drawings prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located and where the system components are manufactured. Include details showing fabrication and assembly of the metal building system. Show anchor bolts settings and sidewall, endwall, and roof framing. Include transverse cross-sections. Design analysis shall be included, to show all design loads, load combinations, foundation reactions and lateral deflections.
2. Building Accessory Components: Provide details of metal building accessory components to clearly indicate methods of installation.

D. Installer certificates signed by metal building manufacturer written certification certifying that the installer complies with requirements included under the "Quality Assurance" Article.

E. Professional engineer's certificate prepared and signed by the responsible design Engineer, legally authorized to practice in the jurisdiction where Project is located and where the system components are manufactured, verifying that the structural framing and covering panels meet indicated loading requirements and codes of authorities having jurisdiction.

F. Qualification data for manufacturer, Design Engineer, fabricator and installer.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced Installer to erect the pre-engineered metal building who has specialized in the erection and installation of types of metal buildings systems similar to that required for this project and who is certified in writing by the metal building system manufacturer as qualified for erection of the manufacturer's products. Refer to Section 01015 - "Special Conditions" for additional information and minimum experience requirements.

B. Manufacturer's Qualifications: Provide pre-engineered metal buildings manufactured by a firm with no less than 5-years experience in manufacturing metal buildings systems that are similar to those indicated for this project and have a record of successful in-service performance.

C. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures". Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12-months. If recertification of welders is required, retesting will be Contractor's responsibility.

D. Refer to Section 01015 - "Special Conditions" for additional information and minimum experience requirements.

E. Single-Source Responsibility: Obtain the metal building system components, including structural framing, any wall and roof covering, and accessory components, from one source from a single manufacturer.

F. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of the pre-engineered metal buildings and are based on the specific type and model indicated. Metal building systems having equal characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

G. **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, Building Commission Inspector, General Contractor, Roofing Contractor, Roof Deck Manufacturer (if applicable), and the Roofing Materials Manufacturer (if warranty is required of this manufacturer). If equipment of substantial size is to be placed on the roof, the Mechanical Contractor must also attend this meeting.

1. 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 specifications, roof plans, roof deck information, flashing details, and approved shop drawings, submittal data, and samples. If conflict exists between the specifications and the Manufacturer's requirements, this shall be resolved. If this pre-roofing conference cannot be satisfactorily concluded without further inspection and investigation by any of the parties present, it shall be reconvened at the earliest possible time to avoid delay of the work. In no case should the work proceed without inspection of all roof deck areas and substantial agreement on all points.

2. The following are to be accomplished during the conference:

    a. Review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
    b. Establish trade-related job schedules, including the installation of roof-mounted mechanical equipment.
    c. Establish roofing schedule and work methods that will prevent roof damage.
    d. Require that all roof penetrations and walls be in place prior to installing the roof.
    e. Establish those areas on the job site that will be designated as work and storage areas for roofing operations.
    f. Establish weather and working temperature conditions to which all parties must agree.
    g. 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.

3. The Architect shall prepare a written report indicating actions taken and decisions made at this pre-roofing conference. This report shall be made a part of the project record and copies furnished the General Contractor, the Owner, the Building Commission, and the Building Commission Inspector.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Comply with manufacturer's current written instructions and recommendations.

B. Deliver prefabricated components, any sheets, any panels, and other manufactured items so they will not be damaged or deformed.

C. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay that work.

D. Handling: Exercise care in unloading, storing, and erecting metal building system, and any wall and roof covering panels, to prevent bending, warping, twisting, and surface damage.

E. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store any metal wall and roof panels so that water accumulations will drain freely. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

F. 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.

G. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 WARRANTY AND GUARANTEE:

A. Metal Building System and Wind Warranty: The manufacturer/installer shall jointly, in writing, warrant that the Pre-Engineered Metal Building System shall remain intact (without perceptible deformation or failure of the metal wall and roof panels or structure within the warranty period) and completely leak free for a period of **20-years** from the date of project Substantial Completion

1. Note: This warranty need not cover damage from winds exceeding the velocities and/or loading required by the International Building Code as generated by a design velocity based on the 100-year probability wind speed, unless otherwise indicated and/or normally provided for the products specified.
2. Warranty Periods (from date of project "Substantial Completion"):

   a. Wind and Weathertightness: **20-years**.
   b. Metal Panel Finishes - 2-Coat "Kynar 500": **20-years**.
   c. Metal Panel Finishes - Siliconized Polyester: **10-years**; Interior liner panels only, (if any).
   d. Materials and Workmanship: **3-years**.
   e. Incidental Warranties by Manufacturers of Components: Manufacturer's standard warranties, passed on to the Owner.

B. Special Project Guarantee: Provide General Contractor's Roofing Guarantee, on form included at General Conditions section of this Project Manual.

C. Repairs that become necessary, such as for leaks, wind damage or temperature stress while building, roofing and siding systems are under warranty and/or guarantee, shall be performed by the installer within 7-days of notification. Should for any reason, the installer not be able to perform the repairs, it shall be incumbent upon the manufacturer to do so. If repairs are not begun on time, Owner shall have work done by others and costs will be charged to the Contractor, with no detrimental effect on the remaining warranty and no termination of warranty.

D. The above warranty and guarantee shall be in addition to, shall be in effect simultaneously with, and shall not alter or limit other project or product warranties or guarantees, nor shall they serve as limitations to other remedies available to the Owner.

E. Standard manufacturer's roofing warrantees and guarantees which contain language regarding the governing of the warrantees and guarantees 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 warrantees and guarantees.

1.8 EXTRA MATERIALS:

A. Maintenance Stock: Furnish at least 5-percent excess over required amount of nuts, bolts, screws, washers, and other required fasteners for metal building. Pack in cartons labeled to identify the contents and store on the site where directed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturer: Subject to compliance with specified requirements, provide metal building systems provided by one of the following:

1. A&S Building Systems
2. ACI Building Systems, Inc.
3. American Buildings Co. *(Basis for Design)*
..4. Architectural Integrated Metals, Inc.
5. Armco Steelox Building Systems.
6. Atlantic Building Systems.
7. Bigbee Steel Buildings, Inc.
8. Butler Manufacturing Co.
9. Ceco Buildings Division.
10. Gulf States Manufacturers, Inc.
11. Mesco Building Solutions
12. Metal Building Components, Inc.
13. O.S.I., Inc.
14. Star Buildings Division, H. H. Robertson Co.
15. Varco-Pruden Buildings.

2.2 MATERIALS:

A. Hot-Rolled Structural Steel Shapes: Comply with ASTM A 572 or A 529.

B. Steel Tubing or Pipe: Comply with ASTM A 500, Grade B, ASTM A 501, or ASTM A 53.

C. Steel Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with ASTM A 529, ASTM A 570, or ASTM A 572.

D. Steel Members Fabricated by Cold Forming: Comply with ASTM A 607, Grade 50.

E. Cold-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 366 or ASTM A 568.

F. Hot-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 568 or ASTM A 569.

G. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 446 with G90 coating complying with ASTM A 525. Grade to suit manufacturer's standards.

H. Aluminum-Zinc Alloy Coated Steel Sheets ("Galvalume"): Comply with ASTM A 428, latest edition.

I. Thermal Insulation: Provide 3" thick glass fiber blanket insulation of not less than0.6 lb.. per cu. ft. density, thickness as indicated, with UL flame spread classification of 25 or less, and 3" wide continuous vapor tight edge tabs.

1. Vapor Barrier: Embossed white vinyl/foil facing white in color, with a perm rating of 0.01 or less (ASTM E-96A).

J. Bolts for Structural Framing: Comply with ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

K. Anchor Bolts: ASTM F 1554, headed type unless otherwise indicated.

L. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

1. Products offered by manufacturers to comply with requirements for non-metallic, non-shrink grout include the following:

a. Euco N.S.; Euclid Chemical Company
b. Crystex; L&M Construction Chemicals
c. Masterflow 713; Master Builders
d. Five Star Grout; U.S. Grout Corp.
e. Upcon; Upco Chemical Division, USM Crop.
f. Propak; Protex Industries, Inc.

M. Paint and Coating Materials: Comply with performance requirements of the federal specifications indicated. Unless specifically indicated otherwise, compliance with compositional requirements of federal specifications indicated is not required.

1. Shop Primer for Ferrous Metal: Fast-curing, lead-free, abrasion- resistant, rust-inhibitive primer selected by the manufacturer for compatibility with substrates with types of alkyd finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with FS TT-P-86, Types I, II, or III.
2. Shop Primer for Galvanized Metal Surfaces: Zinc dust-zinc oxide primer selected by the manufacturer for compatibility with substrate. Comply with FS TT-P-641.

2.3 STRUCTURAL FRAMING:

A. Rigid Frames: Fabricate from hot-rolled structural steel shapes. Provide factory-welded, shop-painted, built-up "I-beam"-shape or open-web-type frames consisting of tapered or parallel flange beams and straight columns. Furnish frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.

1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standards, and proposed in writing by manufacturer and accepted in writing by Architect prior to Bid Date.
2. Provide rigid frames at end walls where indicated.

B. Primary Endwall Framing: Provide the following primary endwall framing members fabricated for field-bolted assembly:

1. Endwall Columns: Manufacturer's standard shop-painted, built-up factory-welded "I"-shape or cold-formed "C" sections, fabricated from 14-gage (0.0747-inch) steel.
2. Endwall Beams: Manufacturer's standard shop-painted "C"-shape roll-formed sections fabricated from 16-gage (0.0598-inch) steel.

C. Secondary Framing: Provide the following secondary framing members:

1. Roof Purlins, Sidewall and Endwall Girts: "C"-or "Z"-shaped sections fabricated from 16-gage (0.0598-inch) shop-painted roll-formed steel. Purlin spacers shall be fabricated from 14-gage (0.0747-inch) cold-formed galvanized steel sections.
2. Eave Struts: Unequal flange "C"-shaped sections formed to provide adequate backup for both wall and roof panels. Fabricate from 16-gage (0.0598-inch) shop-painted roll-formed steel.
3. Flange and Sag Bracing: 1-5/8-inches by 1-5/8-inch angles fabricated from 16-gage (0.0598-inch) shop-painted roll-formed steel, unless indicated otherwise on Structural Drawings.
4. Base or Sill Channels: Fabricate from 14-gage (0.0747-inch) cold-formed galvanized steel sections.
5. Secondary endwall structural members, except columns and beams, shall be the manufacturer's standard sections fabricated from 14-gage (0.0747-inch) cold-formed galvanized steel.

    a. Provide similar members at jambs and headers of Doors, Louvers and Windows.

D. Wind Bracing: Provide adjustable wind bracing using 2-inch with ASTM A 36 or ASTM A 572, Grade D. Locate interior end bay bracing only where indicated, or required by project conditions.

E. Bolts: Provide shop-painted bolts except when structural framing components are in direct contact with roofing and siding panels. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels.

2.4 SHOP PAINTING:

A. General: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power-tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning, unless specific procedures are indicated otherwise. Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on portions and initial 2-inch of embedded areas only.

1. Do not paint surface which are to be welded or high-strength bolted with friction-type connections.
2. Prime structural steel primary and secondary framing members with the manufacturer's standard rust-inhibitive primer.
3. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust-zinc oxide primer.
4. **Apply 2-coats of paint to surfaces which are inaccessible after assembly or erection**. Change color of second coat to distinguish it from the first coat.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning," followed by SP-3 "Power Tool Cleaning."

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

2.5 PREFINISHED ROOFING, SIDING AND LINER PANELS:

A. Face Sheets: Fabricate wall, roof and liner panel face sheets to the profile or configuration indicated from minimum 24-gage (0.00179-inch), 50,000 p.s.i. yield steel sheet. Finish shall be manufacturer's standard **2-coat** (i.e.: primer and color coat) "Kynar 500" 70% resin coating, with a minimum dry film thickness (DFT) of 1.6-mils (*except 10-year warranted siliconized polyester coating at any interior liner panels only*). Base metal shall be one of the following:

1. ASTM A 792 aluminum-zinc allow coated steel sheet ("Galvalume"), or
2. ASTM A 653, G-90 (galvanized) zinc-coated steel sheet.

B. Profiled and Any Ribbed Wall Panels and Flat Soffit Panels - Only Where Other Soffit Panels or Systems Are Not Indicated: Fabricate wall panel system face sheets and sheet metal accessories to the profile or configuration indicated, designed for mechanical attachment of panels to wall girts and base and eave channels using exposed fasteners and sealants.

1. Horizontal and Vertical Profile Metal Wall Panels: As indicated on the Drawings by one of the above-named manufacturers.

2. Soffit Panels: "Moduleze", flat profile, perforated / vented panel system and trim, from edge to edge of soffits, and at recessed entries and similar conditions.

    a. Provide unperforated, with provisions for drainage and with matching fascia at locations where any suspended and wall-anchored canopies are indicated.

3. Finish: "Kynar 500" 70% resin coating system; Manufacturer's standard 20-year warranted **2-coat** system at wall and soffit panels.
4. Colors: As selected by Owner and Architect after bidding, from manufacturer's full line of standard non-metallic color selections, to include a minimum of 12 colors to select from and color to match metal roofing or windows.

C. Standing Seam Roof Panels: Manufacturer's standard factory-formed roof panel system and accessories designed for mechanical attachment of panels to roof purlins and framing, and machine seaming.

1. Roof Panels - Basis of Design: "**Loc-Seam 360**" roofing system, as manufactured by American Buildings Co.; Eufaula, Alabama; Phone: 334/687-2032; or approved equivalent by one of the above named manufacturers, with concealed anchorage and sealant systems; **Machine seamed.**
2. Finish: Manufacturer's standard 20-year warranted **2-coat** "Kynar 500" 70% resin coating system.
3. Colors: As selected by Owner and Architect after bidding, from manufacturer's full line of standard non-metallic color selections, to include a minimum of 12 colors to select from and color to match metal roofing or windows.

D. Liner Panels - Only Where Specifically Indicated on the Drawings: Manufacturer's standard corrugated, stucco embossed pebble finish metal, in same metal and finish as wall panels; Reverse-Rolled R-Panel unless otherwise indicated on the Drawings.

1. Depth: 1-1/4" to 1-1/2" deep Reverse-Rolled R-Panel, with semi-exposed fasteners semi-concealed within flutes.
2. Trim: Provide matching j-mould or other acceptable trim at edges that would otherwise be exposed in the completed installation.
3. Provide support acceptable to building manufacturer at otherwise unsupported edges of liner panels.
4. Finish: Manufacturer's standard 10-year warranted Silicone-Polyester baked enamel finish system at interior liner panels only.
5. Colors: As selected by Owner and Architect after bidding, from manufacturer's full line of standard non-metallic color selections, to include a minimum of 12 colors to select from, including white.

E. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
2. Use only aluminum or stainless steel fasteners for exterior application and galvanized or cadmium-plated fasteners for interior applications.

3. Locate and space fastenings in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
4. Provide fasteners with heads matching color of roofing or siding sheets by means of factory-applied coating. Caps or covers will not be acceptable.

F. Accessories: Provide the following sheet metal accessories factory-formed of the same material (except 50,000 p.s.i. yield) in the same finish as roof and wall panels:

1. Flashings.
2. Closures.
3. Fillers.
4. Metal expansion joints.
5. Ridge caps.
6. Fascias and trim.
7. Gutters and downspouts.

G. Flexible Closure Strips: Closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips. Cut or premolded to match configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.

H. Sealing Tape: Pressure-sensitive 100-percent solids gray polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 2-inch wide and 1/8-inch thick.

I. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.

1. Refer to Section 07900 - "Joint Sealers," for additional information.

2.6 SHEET METAL ACCESSORIES:

A. General: Provide coated steel sheet metal accessories with coated steel roofing and siding panels.

B. Gutters: Refer to Division 7 Section "Flashing and Sheet Metal". Form in 10-foot-long (minimum) sections, complete with end pieces, outlet tubes, and other special pieces as required. Size in accordance with SMACNA. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs. Furnish gutter supports spaced 36-inches on center, constructed of same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish to match roof fascia and rake.

C. Downspouts: Refer to Division 7 Section "Flashing and Sheet Metal". Form in 10-foot-long sections, complete with elbows and offsets. Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1-inch away from walls; locate fasteners at top and bottom and at approximately 5-feet on center in between. Finish to match gutters or wall panels, as selected by Architect.

1. Provide off-set wall anchor straps at top, bottom, and no more than 5'-0" o.c.
2. Provide precast concrete splashblock with 3 raised edges, approximately 12" x 24", for each downspout that would otherwise spill out onto grade or paving, and metal pan for any downspout that would otherwise spill out onto roofing below.

2.7 FABRICATION:

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly.

1. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged, and reassembled with a minimum amount of labor.
2. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

B. Structural Framing: Shop-fabricate framing components to indicated size and section with base plates, bearing plates, and other plates required for erection, welded in place. Provide holes for anchoring or connections shop-drilled or punched to template dimensions.

1. Shop Connections: Provide power riveted, bolted, or welded shop connections.
2. Field Connections: Provide bolted field connections.

2.8 METAL FINISHES:

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Apply coatings either before or after forming and fabricating panels, as required by coating process and as required for maximum coating performance capability. Protect coating either by application of strippable film or by packing plastic film or other suitable material between panels in a manner to properly protect the finish. Furnish air-drying spray finish in matching color for touch-up, in the event touch-up is allowed by the Architect; However, it is probable that the Architect will require replacement of any materials which exhibit any damage to finishes.

1. Durability: Provide coating that has been field tested under normal range of weathering conditions for minimum of 20-years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of No. 8 in accordance with ASTM D 659; and without fading in excess of 5-NBS units.

D. Finishes: Roof Panels, Closures, Exposed Trim, Gutters, Downspouts, and Similar Items.

1. High Performance Organic Coating: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: as specified below); Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

2. Fluorocarbon Coating System: Manufacturer's standard **2-coat** "Kynar 500" thermo-cured system composed of specially formulated inhibitive primer and fluorocarbon color coat, containing not less than 70 percent polyvinylidene resin by weight, and 30 percent reflective gloss when tested in accordance with ASTM D 523; Minimum total dry film thickness of 1.6-mils; Note that the finish system may be a traditional liquid or powder

coat complying with AAMA 2605.

3. Except 10-year warranted siliconized polyester coating at interior liner panels only.

4. Colors: As selected by Architect after Bid Date, from manufacturer's **full line** of non-metallic colors, to include in part, color(s) to match metal roofing or window colors.

   a. The interior color finish shall consist of a backer coat with a minimum dry film thickness of 0.5-mil "Kynar 500".

PART 3 - EXECUTION

3.1 ERECTION:

A. Surveys: Employ a registered professional engineer or and surveyor, experienced in survey work, to establish permanent bench marks as shown and as necessary for accurate erection of pre-engineered steel structures. Check elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

   1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate location.
   2. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete.

E. Setting Bases and Bearing Plates: Clean concrete 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 steel wedges or shims or other adjusting devices.
   2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove steel 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 of plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

      a. Moist cure grout for not less than 7-days after placement.

F. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.
2. See base plates with double-nutted anchor bolts, and as otherwise required.
3. Splice members only where indicated and accepted on shop drawings.
4. Purlins and Girts: Provide rake or gable purlins with tight-fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.
5. Bracing: Provide diagonal rod or angle bracing in roof and sidewalls as indicated.

    a. Movement-resisting frames may be used in lieu of sidewall rod bracing, to suit manufacturer's standards.
    b. Where diaphragm strength of roof or wall covering is adequate to resist wind forces, rod or angle bracing will not be required, except when indicated on Structural Drawings.

6. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.
7. Roofing and Siding:

    a. General: Arrange and nest sidelap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage.

        1) Field cutting of exterior panels by torch is not permitted.
        2) Provide weatherseal under ridge cap. Flash and seal roof panels at eave, rake, ventilators, and similar locations with rubber, or neoprene, or other acceptable closures to exclude weather and in compliance with warranty requirements.
        3) Install roof fall protection and finished ceiling/insulation support system in compliance with manufacturer's current written instructions and recommendations. Replace support system which is damaged, and at any location where it is improperly installed or anchored; Install thermal blocks in compliance with same requirements, at walls and roofs.
        4) Install roof and wall insulation as the roofing and siding work progresses. Replace insulation which becomes wet or is otherwise damaged. Adjust insulation so that no bowing or other deformation occurs in roofing and/or siding panels. Install so that there is a continuous thermal barrier between the building interior and exterior. "Shingle" laps in insulation vapor barrier, to direct water and/or condensation down and out of the building without reaching the building interior. Seal joints and laps in strict accordance with manufacturer's current written instructions and recommendations.

b. Roof Sheets: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheets and skylights, protruding equipment, roof ventilators, vents, and accessories. Seal joints in roof panels in accordance with roof manufacturer's current written recommendations and requirements. **Machine-seam** joints in roof panels in accordance with roof manufacturer's written recommendations and requirements.

1) Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps, and on side laps of corrugated nesting-type, ribbed, or fluted panels and elsewhere as needed to make roof sheets weatherproof to driving rains.
2) Align with corrugations in wall panels.

c. Wall Sheets: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with the sealant manufacturer's current written instructions and recommendations.

1) Align bottom of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws. Fasten window and door frames with machine screws or bolts. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
2) Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3) Provide weatherproof flashing, and weatherproof counterflashing escutcheons for pipe and conduit penetrating exterior walls.
4) Align with corrugations in roof panels.

G. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

I. Sheet Metal Accessories: Refer to Division 7 Section "Flashing and Sheet Metal" and Division 10 Section "Louvers and Vents." Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

1. Provide 1-precast concrete splashblock at each downspout which drains onto grade, and 1-preformed metal pan at each downspout which drains onto roof below.

a. Size: Approximately 12-inches wide x 28-inches long x 3-inches high, including raised edge at sides and one end.

J. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Apply paint to exposed areas with same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry fill thickness of 2.0-mils.

3.2 FIELD QUALITY CONTROL:

A. The Contractor shall engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. It shall be the responsibility of the Contractor to notify testing laboratory with sufficient information and in sufficient time for the laboratory to perform inspections and tests.

1. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated or produces so that required inspection and testing can be accomplished.
3. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
4. Contractor shall correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

B. Shop Bolted Connections: Inspect in accordance with AISC specifications.

C. Shop Welding: Inspect during fabrication of structural steel assemblies, as follows:

1. Certify welders and conduct inspections 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.

D. Field Bolted Connections: Inspect in accordance with AISC specifications.

E. Field Welding: Inspect during erection of structural steel as follows:

1. Certify welders and conduct inspections 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.

F. Special Inspections: As required by Building Code, shall be coordinated by the Contractor and conducted by a qualified, independent testing agency, employed and paid by the Owner. Refer to Structural Drawings and Building Code for additional information and requirements.

END OF PRE-ENGINEERED METAL BUILDING SYSTEMS

DIVISION 15 SPECIFICATIONS



THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15050

GENERAL HVAC REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes general requirements for the HVAC systems.

1.2 QUALIFICATIONS OF SUB-CONTRACTORS

A. Must be properly licensed and established as a Heating and Air Conditioning Contractor at the location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least three systems of this type and size.

1.3 SCOPE

A. Include all equipment, material and labor required for complete operation of heating, air conditioning and ventilation systems, even though every item involved is not indicated. Included in the scope but not limited by the scope are the following complete new operating systems.

1.4 CODES

A. Comply with applicable 2015 International Building Code, and 2015 International Mechanical Code requirements and conform to ordinances and codes of the locality. Where conflicts occur between code and construction drawings or specifications, most stringent requirements shall apply. Any work provided contrary to these requirements shall be removed and replaced at contractor's expense.

1.5 PERMITS

A. Provide all permits and arrange for inspections as required by local, city, county, and state authorities. Furnish certificate of final inspection from local building inspector indicating that installation complies with all regulations governing the same. Provide additional materials, parts, labor, etc. and modify the work as required by city and state inspections and regulations.

1.6 DRAWINGS

A. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings, and lay out work to fit with ceiling grids, lighting, and other trades. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with trades affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

B. The Plans are not intended to show all ductwork, pipes valves, fittings, connections, and details of the work to be done. The piping, duct and equipment locations shall be adhered to as closely as possible; however, any changes necessary to avoid columns, beams, lighting fixtures, ductwork, sprinkler piping, etc., shall be made at no additional cost to the owner. Do not scale plumbing or HVAC drawing. Refer to Architectural drawings for dimensions.

1.7 CHANGES AND CONFLICTS

A. If during construction desirable or necessary changes become apparent, advise the Architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.

1.8 WARRANTY

A. Contractor shall provide a two-year full parts and labor warranty for materials and workmanship for all items starting at substantial completion of entire project. The following items: but not limited to the following, shall have extended warranties remain in effect past the two-year warranty. All warranty shall start at substantial completion of entire project.

1. AC Equipment:
   Provide 2-year labor warranty for entire system.
   Provide 5-year parts warranty for compressors.
2. Control System - Provide 2-year parts and labor warranty for entire system.
3. Filters - Contractor shall change all filters every two months for first year.

1.9 MISCELLANEOUS REQUIREMENTS

A. Materials and Equipment: New and of best quality in every respect. All pipes and fittings shall conform to the ASTM Standard designated for pipe of each material.

Equipment shall be essentially the standard product of the manufacturer and shall be UL approved where required by Code. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be.

B. Listed Equipment: Being listed as "A supplier of comparable products" means the listed manufacturer will receive consideration if in accordance with all documents, delivery, and space requirements. Being listed does not indicate nor imply the manufacturer's equipment is acceptable for the project. Only the "Base" manufacturer's equipment has been verified for compliance with the documents. The burden of approval of the equipment rests solely with the contractor.

C. Equipment Protection: Protect during construction, duct openings against the entrance of foreign materials and protect all equipment from damage by mortar, paint, weather, etc. Damaged equipment shall be replaced at no expense to project. Make provisions to protect equipment.

D. Finishes: Manufacturer's standard unless otherwise stated. Submit color cards for selection where such choice is specified or available.

E. Charges, Grease, Filters, etc.: Furnish first charges of refrigerant grease, oils, etc., and be responsible for such full charges for the guarantee period, except when loss is due to negligence of Owner. Where disposable type filters are specified, furnish two sets for each air conditioning unit; one set to be used during test period, other set to be installed just prior to occupancy. Contractor shall change all disposable filters every two months for first year. Sets of filters to be installed during one-year guarantee period. Where permanent type is specified, provide disposable type for testing and operating prior to occupancy. Provide Owner a typed list (O & M Manual) of all filter sizes and required quantity.

F. Cleaning and Adjusting: Upon completion of work, clear drains, traps, ducts and pipelines. Adjust all valves, remove rubbish, and leave work in clean and operating condition. Install final permanent type filters only after cleaning of building is completed.

G. Cutting and Patching: Openings are to be laid out and built in; furnish detailed layout drawings to other trades in advance of their work. Piping within or behind walls must be installed before wall is erected. Otherwise, walls, etc. affected must be reworked by trade which erected same at expense of HVAC Contractor; chasing and cutting of new work will not be accepted. HVAC Contractor shall prepare shop drawings of required opening to General Contractor and Architect for review.

H. Foundations: Provide foundations, supports, etc., not specified under other Sections, and as required to mount equipment in a workman like and structurally sound manner. Consult drawings pertaining to other trades to determine extent of their work.

I. Roof Flashing: Roofing work is specified under Roofing Section. Roofer shall be advised of all requirements and all furnished items to be installed before roofing is installed. Roofer shall install all mechanical roof penetration and provide full roof warranty.

J. Vibration and Noise Control: All items of mechanical equipment including air handling units, and fans shall be properly isolated from the structure by means of approved vibration absorbing accessories, foundations or supports.

Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, etc., required thereby. Pay special attention to vibration problems at year end inspection and correct all deficiencies noted.

K. Operating and Maintenance Instructions: Provide the services of a competent person to thoroughly instruct representatives appointed by the owner in the proper operation and care of all equipment and control systems. Furnish a complete set of Operating and Maintenance (O & M Manuals) (and PDF files of all information) instructions in 3 copies (including equipment data, spare parts lists, operating instructions, filter sizes, valves services, control and wiring diagrams) in bound folder form prior to final acceptance. O & M Manuals, Test and Balance report to be submitted 2 weeks prior to final inspection.

L. Painting and Finishing: Clean and paint with two coats of asphalt varnish all exposed ferrous metal parts of mechanical equipment located above ceilings, etc.). Surfaces in finished areas are to be painted by Painting Contractor. Where factory finished items are marred or scratched item must be replaced, or upon approval, may be refinished or touched-up as required to bring to a like-new condition.

M. Where device occurs above a lift-out acoustical ceiling panel, identify the panel with a 3/8" #8 round head self-threading sheet metal screw, screwed into panel with only the head showing. Before inserting, paint head of screw with appropriate color as specified under Pipe Identification and Color Coding. Furnish sample for approval.

N. Dis-similar Metal: Separate all dis-similar metals as required for services. Dis-similar metal shall not touch.

O. Coordination:

1. Mechanical contractor shall submit written verification that he has coordinated all electrical requirements for HVAC with electrical subcontractor. Written document shall indicate any difference between design requirements and actual verified requirements and shall recommend solutions to any conflicts found. Refer to "EXAMPLE" form at end of this section.

NOTE: Mechanical submittals will not be reviewed without this document included.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF GENERAL HVAC REQUIREMENTS

(See Attachment A)

SECTION 15050

ATTACHMENT "A"

THIS PAGE INTENTIONALLY LEFT BLANK

Morris Engineering LLC

James H. Morris, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: XYZ High School - Montgomery, AL DATE: 1-10-11

EQUIP. MARK	DESIGN CHARACTERISTICS					SUBMITTED REQUIREMENTS					CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE		
AH-1	208/3	2 HP	15/3P	30A3P	3#12 & 1#12(G)-1/2"c	208/3	3 HP	20/3P	30A3P	3#12 & 1#12(G)-1/2"c	Y	Change 15/3 CB to 20/3 CB
AH-2	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4"c	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4"c	N	
ACCU-7	208/3	45.3A	60/3P	60A3P	3#6 & 1#10(G)-3/4"c	208/3	43.7A	60/3P	60A3P	3#6 & 1#10(G)-3/4"c	N	
ACCU-9	208/3	15.2A	20/3P	30A3P	3#12 & 1#12(G)-1/2"c	208/3	18.1A	30/3P	30A3P	3#10 & 1#10(G)-3/4"c	Y	See Note 1 below.
CH-1	480/3	155A	200/3P	N/A	3#3/0 &1 #6(G)-2"c	480/3	183A	250/3P	N/A	3#250M&1#4(G)-2 1/2"c	Y	See Note 2 below.

NOTES:
1. ACCU-9 - Change 20/3P CB to 30/3P CB and change circuit to 3#10&1#10G-1/2"c.
2. CH-1 - Change 200/3P CB to 250/3P CB and change circuit to 3#250 MCM&1#4G-2 1/2"c.

EXAMPLE

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

James Doe	Henry Smith	Joe Thomas
Electrical Contractor	Mechanical Contractor	Plumbing Contractor
ABC Electic, Inc.	Smith Heating & Air	Joe's Plumbing Company
Company	Company	Company

THIS PAGE INTENTIONALLY LEFT BLANK

Morris Engineering LLC

James H. Morris, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: _____ DATE: _____

EQUIP. MARK	DESIGN CHARACTERISTICS					SUBMITTED REQUIREMENTS					CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE		

NOTES:

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

Electrical Contractor	Mechanical Contractor	Plumbing Contractor
Company	Company	Company

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15052

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Equipment installation requirements common to equipment sections.
8. Concrete bases.
9. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

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

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink, and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Non-pressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.9 GENERAL

A. General and Special Conditions: Refer thereto for all applicable provisions.

B. Scope: Include all equipment, material and labor required for complete operating plumbing, and gas, even though every item involved is not indicated.

C. Codes: Comply with 2021 International Plumbing Code, 2021 International Building Code, ADA and

OSHA of the locality. Where conflicts occur between code and contact drawings or specifications, most stringent requirements shall apply.

D. Qualifications: Sub-contractor shall be licensed plumber and gas pipe fitter in the locality.

E. Permits: Provide all permits and arrange for inspections as required by city, county, and state authorities.

F. Drawings: In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, fittings, and equipment with the detail architectural, structural, and electrical drawings and layout work so as to fit in with other parts. Where doubts arise as to the leaning of the plans and specifications, obtain the Architect's decision before proceeding with parts as may be affected; otherwise, the Contractor shall be liable for damage to work and for removing and repairing his own work in proper manner.

G. Changes: If during construction, desirable or necessary changes become apparent, advise the Architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.

H. Existing Conditions: Bidders shall visit site and become acquainted with all job conditions. No consideration will be given after bid opening for alleged misunderstanding regarding utility connections, permits, fees, etc.

I. Prior Approval: Bidders shall submit equipment for prior approval 10 days before bid date.

J. Warranty: Guarantee in writing to make good without cost any defects in materials and workmanship within one year from the date of acceptance of project.

K. Submittals:

1. Within 25 days the award of the contract and before any orders are planned, the contractor shall submit to the Architect for approval seven (7) copies of a complete list of all proposed materials and all equipment, include catalog data, capacities, model numbers, any accessories, and any pertinent information to indicate full compliance with specification and drawings. Partial list will not be accepted. Rejected items shall be resubmitted until approval has been obtained.

2. The contractor shall submit shop drawings on the following items but not limited to the following items.

    a. List of proposed materials and equipment.
    b. Letter stating coordination of plumbing, mechanical and electrical work, signed by plumbing, mechanical, electrical, and general contractors. Submittals and shop drawings will not be reviewed without receipt of this item.
    c. Shop drawing showing coordination of Plumbing and Electrical.
    d. Showing drawing of Plumbing of a scale of not less than 1/8-inch equals one foot. The drawing shall show coordination with all HVAC, lighting, conduit, equipment, & etc.
    e. Pipe hanger shop drawings including methods of attachment to structure anchors.
    f. Schedule of insulation to be used including thickness. Submittal literature on all insulation, mastics, and materials. Include flame spread and smoke developed ratings.
    g. Access panels.
    h. Notify Architect of all pressure tests to be preformed.
    i. Water closets and accessories. (security type)

j. Lavatories and accessories. (security type)
k. Type water piping and accessories.
l. Type sanitary drain and vent piping and accessories
m. Cleanouts (wall, floor, etc.)
n. Floor drains
o. Valves
p. Water hammer arrestor
q. Trap guards and trap primers.
r. Urinal and accessories. (security type)
s. Mop Basin and accessories.
t. Water heaters and accessories.
u. Electric water cooler and accessories.

3.10 PROJECT CLOSE-OUT:

A. Prior to issuance of certificate for final payment, submit to Architect and obtain his approval of the following:

1. A letter signed by the subcontractors for plumbing and electrical work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired, and that controls and power circuits will function properly.

2. Record drawings – waste and vent piping (ACAD 2010 or higher).

3. Record drawings – water piping (ACAD 2010 or higher).

4. Record drawings – gas, air and miscellaneous systems (ACAD 2010 or higher).

5. Lose tee keys for wall hydrants shall be turned over to owner.

6. Water/Air pressure test for waste and water systems.

7. Equipment submittal data (3).

8. Equipment Operating and Maintenance Manuals (3).

9. Maintenance schedule (3).

10. Equipment warranty dates and guarantee (3).

11. List of Owner's Personnel who have received maintenance training.

END OF COMMON WORK RESULTS FOR PLUMBING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15061

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb (340 kg).
b. Medium (MSS Type 32): 1500 lb (680 kg).
c. Heavy (MSS Type 33): 3000 lb (1360 kg).

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.

d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

SECTION 15062

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

C. See Division 15 Section for pipe guides and anchors.

D. See Division 15 Section(s) "Metal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Carpenter & Paterson, Inc.
3. Empire Industries, Inc.
4. ERICO/Michigan Hanger Co.
5. Globe Pipe Hanger Products, Inc.
6. Grinnell Corp.
7. GS Metals Corp.
8. National Pipe Hanger Corporation.
9. PHD Manufacturing, Inc.
10. PHS Industries, Inc.
11. Piping Technology & Products, Inc.
12. Tolco Inc.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation inserts encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.

b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink, and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).

c. Heavy (MSS Type 33): 3000 lb (1360 kg).

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.

d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

SECTION 15076

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, and as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 VALVE TAGS

A. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings as specified under 1510 B.6.

B. Provide location labels on ceiling grid for all valves above ceiling plastic label with adhesive backing 3.2mm thick. Provide engraved valve tag #. Background color white. Letter color red for HW. Blue for CW. Black for HWR 1/4” high letters.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 9 Section "Interior Painting."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

2. Storm Drainage Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3. Domestic Hot Water Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

4. Gas Piping:

   a. Background Color: Yellow.
   b. Letter Color: Black.

D. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings as specified under 1510 B.6.

END OF IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15077

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Duct labels.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
   2. Letter Color: White.
   3. Background Color: Black.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
   6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   7. Fasteners: Stainless-steel rivets or self-tapping screws.
   8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 REFRIGERANT PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating indoor and outdoor unit served.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of indoor and outdoor using same designations or abbreviations as used on Drawings.
   1. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Install or permanently fasten labels on each refrigerate line set. DO NOT label refrigerant with aluminum jacketing.

C. Locate equipment labels where accessible and visible.

END OF IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

SECTION 15082

PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Mineral fiber.

2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Field-applied jackets.

B. Related Sections include the following:

1. Division 15 Section "HVAC Insulation."

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.
8. Detail field application for each equipment type.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Insulation to be installed by licensed insulation contractor.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in the “Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto PVC Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.

b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.

2. Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c. Tee covers.
d. Flange and union covers.
e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.

3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to

flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by the Contracting Officer. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

B. Domestic Chilled Water (Potable): Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

C. Stormwater and Overflow: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

D. Roof Drain and Overflow Drain Bodies: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

END OF PLUMBING INSULATION

SECTION 15086

DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:
1. Indoor, concealed supply air.
2. Indoor, exposed supply air.
3. Indoor, concealed return air and outdoor air.
4. Indoor, exposed return air and outdoor air.

B. Related Sections:
1. Section 15088 "HVAC Piping Insulation."
2. Section 15815 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 15.

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 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.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Aeroflex USA, Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory applied FSK jacket. Factory-applied jacket requirements are specified in the "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; SoftTouch Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Friendly Feel Duct Wrap.
   d. Manson Insulation Inc.; Alley Wrap.
   e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA, or Type IB. For duct and plenum applications, provide insulation with factory applied FSK jacket. Factory-applied jacket requirements are specified in the "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; Commercial Board.
   b. Johns Manville; 800 Series Spin-Glas.
   c. Knauf Insulation; Insulation Board.
   d. Manson Insulation Inc.; AK Board.
   e. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; FlameChek.
   b. Johns Manville; Firetemp Wrap.
   c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
   d. Thermal Ceramics; FireMaster Duct Wrap.
   e. 3M; Fire Barrier Wrap Products.
   f. Unifrax Corporation; FyreWrap.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: Aluminum.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum and Stainless-Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   a. Sheet and roll stock ready for shop or field sizing.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
   d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

D. Self-Adhesive Outdoor Jacket: 60-mil- (1.5-mm-) thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with white aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Polyguard Products, Inc.; Alumaguard 60.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches (75 mm).
2. Thickness: 6.5 mils (0.16 mm).
3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches (50 mm).
2. Thickness: 3.7 mils (0.093 mm).
3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.8 SECUREMENTS

A. Bands:

1. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030-inch (0.76 mm) thick by 2 inches (50 mm) square.
b. Spindle: Aluminum, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, galvanized steel.

2.9 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces, free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. 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.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over compress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.

e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 07841 "Through-Penetration Firestop Systems."

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09911 "Exterior Painting" and Section 09912 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of

inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply air.
2. Indoor, exposed supply air.
3. Indoor, concealed return air and outdoor air.
4. Indoor, exposed return air and outdoor air.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.2 inches thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density. R-8 minimum.

B. Concealed, return-air and outdoor air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2.2 inches thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density. R-8 minimum

C. Concealed, exhaust-air plenum insulation shall be the following:

1. No insulation.

D. Exposed, supply-air duct insulation shall be the following:

1. Internally lined (See ductwork).

E. Exposed, return-air and outdoor air duct insulation shall be the following:

1. Internally lined (See ductwork).

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Ducts and Plenums:

1. Aluminum, with 1-1/4-Inch- (32-mm-) Deep Corrugations: 0.032 inch (0.81 mm) thick.

END OF DUCT INSLUATION

SECTION 15088

HVAC PIPING INSULATION

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 insulating the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Refrigerant suction and hot-gas piping.

B. Related Sections:

1. Section 15086 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any). Submit to engineer for approval.

B. Shop Drawings: Submit for approval to engineer plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing 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.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 15062 "Hangers and Supports for HVAC Piping and Equipment."

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.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Johns Manville; Micro-Lok.
   b. Knauf Insulation; 1000-Degree Pipe Insulation.
   c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory applied ASJ. Factory-applied jacket requirements are specified in the “Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

2.3 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

2.4 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

2.5 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.

3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Metal Jacket:

1. Aluminum Jacket – Stucco Embossed Finish: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
    a. Sheet and roll stock ready for shop or field sizing.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lb./inch in width.

2.8 SECUREMENTS

A. Bands:

1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. All insulated items shall be in a vapor barrier, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. 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 07841 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

E. 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 07841 "Through-Penetration Firestop Systems."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against

adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating

cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FINISHES

A. Aluminum jacket shall be factory stucco finish.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection

shall be limited to three locations of straight pipe, three locations of fittings, for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Condensate Drain:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1/2 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

a. Flexible Elastomeric: 3/4 inch thick.

3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Exposed:

1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.024 inch thick.

END OF HVAC PIPING INSULATION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15111

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.

B. Related Sections:

1. Division 2 water distribution piping Sections for general-duty and specialty valves for site construction piping.
2. Division 15 plumbing piping Sections for specialty valves applicable to those Sections only.
3. Division 15 Section 15076 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.

3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jomar Valve (T-100 CG).
   b. Kitz Corporation.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Red-White Valve Corporation.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two pieces.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE, TFE, or G300.
   h. Stem: Brass.
   i. Ball: T.E.A. coated or chrome plated brass.
   j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jomar Valve (T-200 CSSG)
   b. Conbraco Industries, Inc.; Apollo Valves.
   c. Kitz Corporation.
   d. Milwaukee Valve Company.
   e. NIBCO INC.

2. Description:

   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two pieces.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze or stainless steel.
   i. Ball: Chrome-plated brass or stainless steel.
   j. Port: Regular.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for butterfly, gate and globe valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.
2. Pump-Discharge Check Valves:

    a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two-piece, full port, brass, or bronze with brass trim.
4. Bronze Swing Check Valves: Class 125, bronze disc.

3.5 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two-piece, regular port, brass, or bronze with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

END OF GENERAL DUTY VALVES FOR PLUMBING PIPING

SECTION 15126

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product certificates.

C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ashcroft Inc.
2. Miljoco Corporation.
3. Trerice, H. O. Co.
4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
5. Weiss Instruments, Inc.

C. Standard: ASME B40.200.

D. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch (127-mm) nominal diameter.

E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).

F. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

G. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.

H. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.

I. Window: Plain glass.

J. Ring: Stainless steel.

K. Element: Bimetal coil.

L. Pointer: Dark-colored metal.

M. Accuracy: Plus, or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Miljoco Corporation.
    b. Trerice, H. O. Co.
    c. Weiss Instruments, Inc.

3. Standard: ASME B40.200.
4. Case: Cast aluminum; 7-inch (178-mm) nominal size unless otherwise indicated.
5. Case Form: Adjustable angle unless otherwise indicated.
6. Tube: Glass with magnifying lens and blue organic liquid.
7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
8. Window: Glass.
9. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

10. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
11. Accuracy: Plus, or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.

10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ashcroft Inc.
    b. Miljoco Corporation.
    c. Trerice, H. O. Co.
    d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
    e. Weiss Instruments, Inc.

3. Standard: ASME B40.100.
4. Case: Sealed type(s); cast aluminum or drawn steel; 6-inch (152-mm) nominal diameter.
5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
6. Pressure Connection: Brass, with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
7. Movement: Mechanical, with link to pressure element and connection to pointer.
8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
9. Pointer: Dark-colored metal.
10. Window: Glass.
11. Ring: Metal.
12. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

M. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one o] the following:

1. Liquid-filled, bimetallic-actuated type.
2. Industrial-style, liquid-in-glass type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).

3.4 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Sealed, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:

1. Sealed, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Sealed, direct-mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi (0 to 600 kPa).

END OF METERS AND GAGES FOR PLUMBING PIPING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15140

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Water meters.
4. Escutcheons.
5. Sleeves and sleeve seals.

B. Related Section:

1. Division 2 Section "Water Distribution" for water-service piping in the building.

2. Scope: Connect to new 1 1/2” water meter serving building and extend to all plumbing fixtures, etc. Provide gate valve in box, backflow preventer and PRV set at 60 PSI. Pay the water works for any and all cost for meter and connections.

3. Arrange with city for service connection to main, etc. pay city cost of service. Provide full size gate valve.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

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

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

A. Comply with requirements in Division 15 Section 15111 "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 15 Section 15145 "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description:

a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 150 psig (1035 kPa).

c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.6 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

E. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge.

F. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

G. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.7 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

2.8 SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.9 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 15 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 15 Section "Domestic Water Piping Specialties" for drain valves and strainers.

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 15 Section 15145 "Domestic Water Piping Specialties" for pressure-reducing valves.

F. Install domestic water piping level and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. 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.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping adjacent to equipment and specialties to allow service and maintenance.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install thermostats in hot-water circulation piping.

R. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 15 Section 15126 "Meters and Gages for Plumbing Piping" for thermometers.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 15 Section 15111 "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 15 Section 15145 "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping. Comply with requirements in Division 15 Section 15145 "Domestic Water Piping Specialties" for balancing valves.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.6 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 15 Section 15061 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

3. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 15 Section 15410 plumbing fixture sections for connection sizes.
2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of

unions for NPS 2-1/2 (DN 65) and larger.

3.9 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece or split casting, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One-piece, stamped steel with set screw or stamped steel with spring clips.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.10 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or

Other Wet Areas: Steel pipe.

a. Extend sleeves 2 inches (50 mm) above finished floor level.
b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
4. Sleeves for Piping Passing through Exterior Concrete Walls:

a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
b. Cast-iron wall pipe sleeves for pipes NPS 6 (DN 150) and larger.
c. Install sleeves that are large enough to provide 1-inch (25-mm) annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestop materials and installations.

3.11 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.12 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 15 Section 15076 "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.14 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.15 PIPING SCHEDULE

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

B. Under-building-slab, domestic water, building service piping, NPS 3 (DN 80) and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper solder-joint fittings; and brazed joints.

C. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.

D. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and brazed joints.

3.16 VALVE SCHEDULE

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

1. Shutoff Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF DOMESTIC WATER PIPING

SECTION 15145

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Water hammer arresters.
7. Trap-seal primer valves.
8. Aluminum jacket (Provide on all insulated exposed water lines).

B. See Division 15 Section "Domestic Water Piping" for water meters.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1001.
4. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
5. Body: Bronze.
6. Inlet and Outlet Connections: Threaded.
7. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrowhead Brass Products, Inc.
b. Watts Industries, Inc.; Water Products Div.
c. Woodford Manufacturing Company.
d. Zurn Plumbing Products Group.

3. Standard: ASSE 1001.
4. Body: Bronze, nonremovable, with manual drain.
5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
6. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Double-Check Backflow-Prevention Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Flomatic Corporation.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

4. Standard: ASSE 1015.
5. Operation: Continuous-pressure applications, unless otherwise indicated.
6. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

7. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
8. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
9. Configuration: Designed for horizontal flow.
10. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cash Acme.
    b. Conbraco Industries, Inc.
    c. Honeywell Water Controls.
    d. Watts Industries, Inc.; Water Products Div.
    e. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1003.
4. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).
5. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 for NPS 2-1/2 and larger.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and larger.

2.4 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Crane Co.; Crane Valve Group; Jenkins Valves.
    d. Crane Co.; Crane Valve Group; Stockham Div.
    e. Hammond Valve.
    f. Milwaukee Valve Company.
    g. NIBCO INC.
    h. Red-White Valve Corp.

3. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.

4. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.5 WALL HYDRANTS

A. Wall Hydrants (Typical): Freeze proof box type (stainless steel finish) 1/2" nickel plated bronze hose bibb with loose key, J.R. Smith 5509 QT. Install approximately 18" above finished grade.

A. Non-freeze Wall Hydrants:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Watts Drainage Products Inc.
   e. Woodford Manufacturing Company.
   f. Zurn Plumbing Products Group; Light Commercial Operation.
   g. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
4. Pressure Rating: 125 psig (860 kPa).
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
8. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Box: Deep, flush mounting with cover.
10. Box and Cover Finish: Polished nickel bronze.
11. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
12. Nozzle and Wall-Plate Finish: Polished nickel bronze.
13. Operating Keys(s): One with each wall hydrant.

2.6 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AMTROL, Inc.
   b. Josam Company.

c. MIFAB, Inc.
d. PPP Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Tyler Pipe; Wade Div.
h. Watts Drainage Products Inc.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Copper tube with piston.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.7 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Lawler Manufacturing Company, Inc.
b. Leonard Valve Company.
c. Powers; a Watts Industries Co.
d. Symmons Industries, Inc.

4. Standard: ASSE 1017.
5. Pressure Rating: 125 psig (860 kPa).
6. Type: Exposed-mounting, thermostatically controlled water mixing valve.
7. Material: Bronze body with corrosion-resistant interior components.
8. Connections: Threaded or union inlets and outlet.
9. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
10. Valve Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.

2.8 LIMITING VALVES

A. Temperature Limiting Valve: Acorn Model ST-70 for all lavatories, sinks, etc., or equivalent by Watts, Powers, Symmons or T&S.

2.9 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the

following:

a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. PPP Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Tyler Pipe; Wade Div.
h. Watts Drainage Products Inc.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Copper tube with piston.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.10 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MIFAB, Inc.
b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.

3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig (860 kPa) minimum.
5. Body: Bronze.
6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.

7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
9. Trap Guard Insert or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with airgap fitting, fixed airgap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install water hammer arresters in water piping according to PDI-WH 201.

G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

H. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.

I. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Double-check backflow-prevention assemblies.
2. Water pressure-reducing valves.
3. Primary, thermostatic, water mixing valves.

4. Supply-type, trap-seal primer valves.

J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Mechanical Identification."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF DOMESTIC WATER PIPING SPECIALTIES

SECTION 15150

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.3 SUBMITTALS

A. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

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

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Hub-and-Spigot, Cast-Iron Pipe and Fittings: ASTM A 74, Service class.

1. Gaskets: ASTM C 564, rubber.

B. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.

1. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

2. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
b. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

C. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.

D. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
2. Solvent Cement and Adhesive Primer:

a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground, soil, waste, and vent piping shall be the following:

1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.
4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."

B. Basic piping installation requirements are specified in Division 15 Section.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section.

E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 15 Section.

F. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back-to-back or side by side with common drainpipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

L. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section.

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

A. General-duty valves are specified in Division 15 Section "Valves."

B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.

1. Install backwater valves in accessible locations.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches with 3/4-inch (19-mm) rod.

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Install supports for vertical PVC piping every 48 inches (1200 mm).

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 EXPOSED CONDENSATE WASTE PIPING

A. Aquatherm UV Faser: Composite pipe shall be an equal to copper.

B. Provide Aquatherm fittings.

C. Must be a certified installer of Aquatherm systems.

D. Must comply with all manufacturer's requirements and recommendations.

E. Where indicated on the drawings that the pipe will be exposed to direct UV light for more than 30 days, it shall be provided with a factory applied, UV-resistant coating or alternative UV protection.

END OF SANITARY WASTE AND VENT PIPING

SECTION 15155

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
5. Size: Same as connected drainage piping
6. Body Material: As required to match connected piping.
7. Closure: Brass plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. Oatey.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Zurn Plumbing Products Group; Light Commercial Operation.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M for adjustable housing cleanout.
5. Size: Same as connected branch.
6. Type: Adjustable housing.
7. Body or Ferrule: Cast iron.
8. Clamping Device: Required.
9. Outlet Connection: Threaded.
10. Closure: Brass plug with straight threads and gasket.
11. Adjustable Housing Material: Cast iron with threads.
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
13. Frame and Cover Shape: Round.
14. Top Loading Classification: Extra Heavy Duty.
15. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to clean out.

C. Cast-Iron Wall Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M. Include wall access.
5. Size: Same as connected drainage piping.
6. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: Countersunk plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

10. Wall Access: Round stainless-steel wall-installation frame and cover.

D. Cleanouts: Provide in PVC sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 50 feet on 3" and smaller and 75' on 4" and larger on straight runs, and elsewhere as shown. Cleanouts shall be full opening type, completely accessible. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with gasket or gasketed access cover. Catalog numbers from J.R. Smith, MI-FAB and Zurn. Cleanout head shall not extend out past finish wall, except in unfinished spaces.

In tile floors: Zurn ZN1400-SZ1, MI-FAB C1100-5, adjustable, cast-iron body with ABS plug or gasketed access cover and satin finished square adjustable scoriated secured nickel bronze top or stainless-steel top or J. R. Smith 4051, where soft tile occurs provide ZN1400-TX or J. R. Smith 4171 recessed square adjustable secured nickel bronze or stainless-steel top.

In concrete floors: Zurn Z1400, MI-FAB C1100-XR or J. R. Smith 4237, cast iron with round adjustable scoriated cast iron top with non-tilt tractor cover ferrule with ABS plug or gasketed access cover.

In outside lines: Zurn Z1402, MI-FAB C1230 or J. R.Smith 4291, terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In accessible unfinished spaces: Zurn Z1445, MI-FAB C1460 or J. R. Smith 4511S or cast iron with ABS plug as appropriate.

In finished walls: J. R. Smith 4531, MI-FAB C1460-RD or Zurn Z1446 cast iron cleanout tee with countersunk ABS plug and stainless-steel wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide 4402 or MI-FAB C1450-RD extended over from sanitary tee to bring plug within 4 inches.

In terrazzo floors: J. R. Smith 4191, MI-FAB C1100-UR or Zurn ZN1400-Z adjustable cast iron head and ferrule, ABS plug and round adjustable secured nickel bronze or stainless-steel top with 1/2" recess.

2.2 FLOOR DRAINS

D. Cast-Iron Floor Drains:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Light Commercial Operation.

g. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.6.3.
5. Pattern: Area drain.
6. Body Material: Gray iron.
7. Seepage Flange: Required.
8. Anchor Flange: Required.
9. Clamping Device: Required.
10. Outlet: Bottom.
11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
12. Sediment Bucket: As required.
13. Top or Strainer Material: Bronze.
14. Top of Body and Strainer Finish: Rough bronze.
15. Top Shape: Round.
16. Top Loading Classification: Extra Heavy-Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Bronze.
20. Trap Pattern: Deep-seal P-trap.
21. Trap Features: Cleanout and trap-seal primer valve drain connection.

B. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain to have cast iron P-Trap. Provide types as scheduled below.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

Typical Floor Drains: Smith 2005B, MI-FAB1100-C-S or Zurn ZN415-SZ1 two-piece cast iron drains with speedi-set type outlet and adjustable nickel bronze or stainless-steel strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6". Membrane clamp where required. Floor drains shall have tap for trap primer as required by code and deep seal 'P' traps.

Mechanical Room Drains: Smith 2230Y, MI-FAB F1340-TFB-4 or Zurn Z541 two-piece cast iron drain with speedi-set outlet, sediment bucket and cast-iron grate. Membrane clamp as required.

Floor drain: Ligature resistant floor drain; Whitehall Manufacturing Model WHFD.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

E. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

   a. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
   b. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

F. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

G. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

H. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

I. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

J. Fasteners: Metal compatible with material and substrate being fastened.

K. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

L. Solder: ASTM B 32, lead-free alloy.

M. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 15 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 1 inch (25 mm) above floor.

I. Install deep-seal traps on floor drains and condensate waste outlets.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install traps on plumbing specialty drain outlets.

O. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 15 Section "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SANITARY WASTE PIPING SPECIALTIES

SECTION 15183

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A or R-454B:

1. Suction Lines for Heat-Pump Applications: 450 psig (2241 kPa).

2. Hot-Gas and Liquid Lines: 450 psig (2241 kPa).

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.

2. End Connections: Socket ends.

3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.

4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).

5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.

2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.

3. Operator: Rising stem and hand wheel.

4. Seat: Nylon.

5. End Connections: Socket, union, or flanged.

6. Working Pressure Rating: 500 psig (3450 kPa).

7. Maximum Operating Temperature: 275 deg F (135 deg C).

B. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 275 deg F (135 deg C).

C. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig (3450 kPa).

D. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig (2760 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).
8. Manual operator.

E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.

2. Piston, Closing Spring, and Seat Insert: Stainless steel.

3. Seat Disc: Polytetrafluoroethylene.

4. End Connections: Threaded.

5. Working Pressure Rating: 400 psig (2760 kPa).

6. Maximum Operating Temperature: 240 deg F (116 deg C).

F. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.

2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.

3. Packing and Gaskets: Non-asbestos.

4. Capillary and Bulb: Copper tubing filled with refrigerant charge.

5. Suction Temperature: 40 deg F (4.4 deg C).

6. Superheat: Adjustable.

7. Reverse-flow option (for heat-pump applications).

8. End Connections: Socket, flare, or threaded union.

9. Working Pressure Rating: 700 psig (4820 kPa).

G. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.

2. Screen: 100-mesh stainless steel.

3. End Connections: Socket or flare.

4. Working Pressure Rating: 500 psig (3450 kPa).

5. Maximum Operating Temperature: 275 deg F (135 deg C).

H. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.

2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig (3450 kPa).
6. Maximum Operating Temperature: 275 deg F (135 deg C).

I. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

J. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 microns, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

K. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 microns, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.

4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

L. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-410A, or R-454B.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump and AC Unit Applications: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with soldered joints.

B. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with soldered joints.

C. Safety-Relief-Valve Discharge Piping:

1. NPS 1-1/2 and Smaller: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at strainers if they are not an integral part of strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.

2. Thermostatic expansion valves.

3. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 8 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Install traps and double risers to entrain oil in vertical runs.

4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 7 Section "Through-Penetration Firestop Systems."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 7 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 15 Section "Mechanical Identification."

3.4 PIPE JOINT CONSTRUCTION

A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.

2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.

5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).

2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).

3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.

c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If the vacuum holds for 12 hours, system is ready for charging.

3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).

4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.

2. Open compressor suction and discharge valves.

3. Open refrigerant valves except bypass valves that are used for other purposes.

4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF REFRIGERANT PIPING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15410

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plumbing fixtures.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

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

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Combo security fixture: ASTM A 480/A480M

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Faucets: ASME A112.18.1.
2. NSF Potable-Water Materials: NSF 61.
3. Supply Fittings: ASME A112.18.1.
4. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.

3. Faucets: ASME A112.18.1.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Brass and Copper Supplies: ASME A112.18.1.
2. Manual-Operation Flushometers: ASSE 1037.
3. Plastic Tubular Fittings: ASTM F 409.
4. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Grab Bars: ASTM F 446.
3. Off-Floor Fixture Supports: ASME A112.6.1M.
4. Pipe Threads: ASME B1.20.1.
5. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 FIXTURES AND MISCELLANEOUS ITEMS

A. Fixture Trim: Exposed metal parts to be of heavy weight polished brass, heavily chromium plates, of best quality as regularly furnished by the plumbing fixture manufacturer. Supplies to all fixtures and equipment shall be provided with stop valves.

B. Scheduled Items:

WC-1: Water Closet: Security Type; Handicap-ADA compliant. 14 Gauge, Type 304 Stainless Steel all welded Satin Finish. Willoughby Model ETW-1490-FM-FA (H/C).TS – GWC FV (1.6) HPS-Front Access-Floor Outlet-Wall Supply-Gasket Waste Outlet-Hinged Seat.

WC-2: Water Closet: Security Type; 14 Gauge, Type 304 Stainless Steel all welded Satin Finish. Willoughby Model ETW-1490-FM-FA (H/C).TS – GWC FV (1.6) HPS-Front Access-Floor Outlet-Wall Supply-Gasket Waste Outlet-Hinged Seat.

L-1: Lavatory: Security Type; Handicap-ADA complaint. 14 Gauge, Type 304 Stainless Steel all welded Satin Finish. Willoughby Model: HS-1013-46-HC-HS-PMLI-PBH-PT-OV-Front Access-Dual Temperature-P-Trap in Cabinet-4/8" Wall Thickness- Series for Block Wall Mount 34" rim to finish floor. Provide mixing valve.

L-2: Lavatory: Security Type; 14 Gauge, Type 304 Stainless Steel all welded Satin Finish. Willoughby Model: HS-1013-46-HC-HS-PMLI-PBH-PT-OV-Front Access-Dual Temperature-

P-Trap in Cabinet-4/8" Wall Thickness- Series for Block Wall Mount 34" rim to finish floor. Provide mixing valve.

UR-1: Urinal: Security Type: ADA, Handicap Mount 17" up to finish floor. Willoughby Model VW-1317-HEV-TS-FV.

UR-2: Urinal: Security Type: Willoughby Model VW-1317-HEV-TS-FV.

MB-1: Mop Sink: Zurn Z5850-DS cast iron custodial floor mounted floor sink with 3" drain. Provide Z5850-RG rim guard, Zurn Z843M1-RC service sink faucet, JP 1996-24 wall guard, JP1996 HH hose and bracket and JP1996MH mop hanger, Equal units by Central Brass, Amer can Standard, Toto or T & S.

EWC-1: Electric Water Cooler: Elkay LZSTL8WSSK bottle station. Furnish LKAPREZL cane apron as required. Comparable products by Oasis or Haws. Trap, supplies with stops: Zurn or Kohler. Mount 36" spout to finished floor. Finish to be stainless steel. Provide Flex Guard Safety Bubbler. Z1225-BL bi-level lavatory carrier or equal by J.R. Smith or MiFab

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

L. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

M. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

N. Install shower flow-control fittings with specified maximum flow rates in shower arms.

O. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

P. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 15 Section.

Q. Set showers in leveling bed of cement grout. Grout is specified in Division 15 Section.

R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

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

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by the Contracting Officer.

END OF PLUMBING FIXTURES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15485

ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Household, storage electric water heaters.
2. Light-commercial electric water heaters.
3. Commercial electric booster heaters.
4. Commercial, storage electric water heaters.
5. Water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

D. Warranty.

1.3 QUALITY ASSURANCE

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

B. ASHRAE/IESNA-90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Household Electric Water Heaters: Five years.
b. Commercial Electric Water Heaters: Three years.

PART 2 - PRODUCTS

2.1 WATER HEATERS

A. Temperature Limiting Valve: Acorn ST70 for all lavatories, sinks, etc., or equivalent by Watts, Zurn Wilkins, Powers, Symmons, or T & S.

B. Relief Valves: Install (in accordance with USA Standard 221.22) properly sized AGA and ASME approved T&P relief valves with copper overflow lines to floor drain as indicated.

C. Safety Pan: Minimum of 1-1/2" deep X diameter of water heater plus 3" galvanized steel with a minimum of 1" drain.

D. Thermal Expansion Tank: Zurn Wilkins min. cap 2.1 gallons.

E. Provide braided copper bonding jumper between cold and hot water lines for grounding purposes.

F. Provide braided copper bonding jumper between cold and hot water lines for grounding purposes.

G. Circulating Pump: Circulating Pump: Pump shall be Grundfos Alpha 15-55F all bronze pump with 1/20 HP motor, 120V, 1 PH with built-in overload protection. Pump shall have a capacity of 7 GPM at 10-foot head. Comparable products by: Bell & Gossett, Paco.

H. Provide Time Clock (seven-day) for pump control 120/1/60 operating hours, 6:00 A.M. - 5:00 P.M. Monday through Friday. Verify with owner for weekend operation. Tork Model T171.

J. A nominal water containing capacity of 5 gallons if located in building owned by or under the control of the state, county, municipality, separate school district or other public entity.

These units are required to be registered with the state. They receive a biennial inspection and certificate of operation. They are not required to have an installation permit or have ASME/NB stamping.

2.2 WATER HEATER ACCESSORIES

A. Water Heater Stands: Water heater manufacturer's factory-fabricated steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches (457 mm) above the floor.

B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket

for wall mounting and capable of supporting water heater and water.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).

I. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004.

E. Water Regulators: ASSE 1003, water-pressure reducing valve. Set at 25-psig- (172.5-kPa-) maximum outlet pressure, unless otherwise indicated.

F. Shock Absorbers: ASSE 1010 or PDI WH 201, Size A water hammer arrester.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
2. Concrete base construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 15 Section "Plumbing Specialties" for hose-end drain valves.

E. Install thermometer on outlet piping of water heaters. Refer to Division 15 Section "Meters and Gages" for thermometers.

F. Install water regulator, with integral bypass relief valve, in booster-heater inlet piping and water hammer arrester in booster-heater outlet piping.

G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

H. Fill water heaters with water.

3.2 CONNECTIONS

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for

easy removal of water heaters.

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

C. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.

B. Perform the following field tests and inspections:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Demonstration and Training."

END OF ELECTRIC WATER HEATERS

SECTION 15671

OUTDOOR HEAT PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes air-cooled condensing units and outdoor heat pumps.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring diagrams.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

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

B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.

1. Warranty Period (Compressor Only): Five years from date of Substantial Completion.
2. Warranty Period (Condenser and evaporator Coils): Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONDENSING UNITS AND OUTDOOR HEAT PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:

1. Trane
2. Carrier
3. Approved equal.

2.2 OUTDOOR UNITS

A. General:

1. Weatherproofed steel mounting/lifting rails.
2. Hermetic scroll compressors.
3. Plate fin condenser coils.
4. Fans and motors.
5. Standard operating range 50-125˚F (min. 0˚F with low ambient accy.).
6. Nitrogen holding charge.
7. Certified and rated in accordance with AHRI and DOE standards.
8. UL certified.

B. Casing:

1. Zinc coated, heavy gauge, galvanized steel.
2. Weather resistant baked enamel finish.
3. Meets 672 hr salt spray test.
4. Removable single side maintenance access panels.
5. Lifting handles in maintenance access panels.
6. Unit base provisions for forklift and/or crane lifting.

C. Refrigeration System:

1. Dual compressor (10 tons and larger).
2. Two (2) separate and independent refrigerant circuits (10 tons or larger).
3. Each refrigeration circuit is equipped with integral sub-cooling circuit.
4. Two (2) direct drive hermetic scroll compressor with centrifugal oil pump providing lubrication to moving parts.
5. Suction gas-cooled motors with +/- 10% voltage utilization range of unit nameplate voltage.
6. Crankcase heaters.
7. Internal temperature and current sensitive motor overloads.
8. Factory installed liquid line filter driers.
9. Phase loss/reverse rotation monitor.
10. Liquid line service valves (with gauge port).
11. Suction line service valves (with gauge port).
12. External high-pressure cutout devices.
13. External low-pressure cutout devices.
14. Evaporators defrost control.
15. Loss of charge protection (discharge line thermostats).

D. Condenser Coil:

1. 3/8” internally enhanced copper tube mechanically bonded to lanced aluminum rate fins (spine fin coil for five tons or larger).
2. Factory pressure and leak tested to 660 psig.
3. Perforated steel hail-guards available.
4. Provide coil guards.

E. Condenser Fan:

1. Propeller fan(s).
2. Direct drive.
3. Statically and dynamically balanced.

F. Condenser Motor(s):

1. Permanently lubricated, totally enclosed or open construction.
2. Built-in current and thermal overloads.
3. Ball or sleeve bearing type.

G. Controls:

1. Microprocessor.
2. Completely internally wired.
3. Numbered and colored wires.
4. Contactor pressure lugs or terminal block.
5. Unit external mounting location for disconnect device.
6. Single point power entry.
7. 24V control circuit.
8. Control transformer.
9. Anti-short cycle timer.

H. Hail-Guards:

1. Condenser coil protection from hail, vandals, etc.
2. Perforated, painted galvanized steel.
3. Factory or field installed.

2.3 VERIFICATION OF PERFORMANCE

A. Rate condensing units according to ARI 210/240.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units' level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Install condensing units on 4" concrete base.

C. Vibration Isolation: Mount condensing units on neoprene pads with a minimum deflection of 1/2".

D. Maintain manufacturer's recommended clearances for service and maintenance.

E. Connect pre-charged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

F. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Division 15 Section "Refrigerant Piping."

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Verify proper airflow over coils.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

C. Remove and replace malfunctioning condensing units and retest as specified above.

END OF OUTDOOR HEAT PUMPS

SECTION 15725

INDOOR HEAT PUMP UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Constant-air-volume, air-handling units (unless otherwise noted on plans).

1.3 SUBMITTALS

A. Product Data: For each air-handling unit indicated.

1. Unit dimensions and weight.
2. Cabinet material, metal thickness, finishes, insulation, and accessories.
3. Fans:

    a. Certified fan-performance curves with system operating conditions indicated.
    b. Certified fan-sound power ratings.
    c. Fan construction and accessories.
    d. Motor ratings, electrical characteristics, and motor accessories.

4. Certified coil-performance ratings with system operating conditions indicated.
5. Dampers, including housings, linkages, and operators.
6. Filters with performance characteristics.

B. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
2. Support location, type, and weight.
3. Field measurements.

C. Source quality-control reports.

D. Field quality-control reports.

E. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Four set(s) for each air-handling unit.
2. Gaskets: One set(s) for each access door.
3. Fan Belts: Two set(s) for each air-handling unit fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Trane
2. Carrier
3. Approved equal.

2.2 INDOOR AHU

A. General:

1. Completely factory assembled.
2. Convertible for horizontal or vertical configuration.
3. Convertible for cooling only or heat pump application.
4. Convertible for left or right external connections (refrigerant and/or electrical).
5. Convertible for front or bottom air return.

6. Nitrogen holding charge.
7. Certified and rated in accordance with AHRI and DOE standards.
8. Certified to UL 1995 for indoor blower coil units.

B. Casing:

1. Zinc coated, heavy gauge, galvanized steel.
2. Weather resistant baked enamel finish.
3. Access panels with captive screws.
4. Completely insulated with foil faced, cleanable, fire retardant, permanent, odorless glass fiber material.
5. Captured or sealed insulation edges.
6. Electrical connection bushings or plugs.
7. Refrigerant connection bushings or plugs.

C. Refrigeration System:

1. Single or dual circuit.
2. Distributor(s).
3. Thermal expansion valves (TXVs).

D. Evaporator Coil:

1. 3/8” internally enhanced copper tube mechanically bonded to lanced aluminum plate fins.
2. Factory pressure and leak tested to 449 psig.
3. Draw-through airflow.
4. Dual circuits are interlaced/intertwined.
5. Double slope, removable, cleanable, composite drain pan.
6. Four (4) drain pan positions.

E. Indoor Fan:

1. Double inlet, double width, forward and curved, centrifugal type fan.
2. Dual fans on 12.5-20T air handlers.
3. Adjustable belt drive.
4. Permanently lubricated bearings.

F. Indoor Motor:

1. Adjustable motor sheaves.
2. Thermal overload protection.
3. Permanently lubricated bearings.
4. Meet 2007 ASHRAE 90.1.
5. Motors for high static applications.

G. Controls:

1. Completely internally wired.
2. Numbered and colored wires.
3. Magnetic indoor fan contactor.
4. Low voltage terminal strip.

5. Single point power entry.
6. Evaporators defrost control.

H. Filters:

1. Access from side coil panels.
2. Filters slide on the rack.
3. One inch (1”), MERV 8 filters on 5-10-ton units.
4. Two inches (2”), MERV 8 filters on 12.5-20-ton units.

I. Electric Heaters:

1. Heavy duty nickel chromium elements.
2. cETL approved.
3. Installs directly on fan discharges.
4. Two stage control.
5. Single point power entry.
6. Terminal strip connections
7. Automatic line break high limit controls.

2.3 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Refrigerant Coils: Factory tested to 450 psig (3105 kPa) according to ARI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting: Install air-handling units on concrete bases.

1. Minimum Deflection: 1 inch (25 mm).

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air-handling unit to allow service and maintenance.

C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4 (DN 32), ASTM B 88, Schedule 40 PVC piping. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Refrigerant Piping: Comply with applicable requirements in Division 15 Section "Refrigerant Piping." Install shutoff valve and union or flange at each supply and return connection.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup check according to manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
4. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
5. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
6. Verify that outdoor- and return-air mixing dampers open and close and maintain minimum outdoor-air setting.
7. Comb coil fins for parallel orientation.
8. Install new, clean filters.
9. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

B. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace fan and motor pulleys as required to achieve design conditions.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Division 15 Section "Testing, Adjusting, and Balancing" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF INDOOR HEAT PUMP UNIT

SECTION 15739

DUCTLESS SPLIT-SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 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: Five year(s) from date of Substantial Completion.

b. For Parts: Two year(s) from date of Substantial Completion.

c. For Labor: Two year(s) from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: 4 set(s) for each air-handling unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following: Verify that manufacturers retained in the list below make combination of unit components retained.

1. Mitsubishi.

2. Samsung.

3. Fujitsu.

2.2 INDOOR UNITS

A. Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

2. Insulation: Faced, closed cell duct liner.

3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.

4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

5. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

b. Constant speed with internal thermal protection and permanent lubrication.

c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

7. Filters: Permanent, cleanable.

8. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2004.

b. Single-wall, galvanized-steel sheet, or HDPE molded sheet.

c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

2.3 OUTDOOR UNITS

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

2. Compressor: Hermetically sealed with crank case heater with variable speed drive and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.

b. Refrigerant Charge: R-410A.

c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240.

d. Coil Guards.

3. Fan: Aluminum-propeller type, directly connected to motor.

4. Motor: Permanently lubricated, with integral thermal-overload protection. Motor to have variable speed drive.

5. Low Ambient Kit: Permits operation down to 10 deg F (-12.22 deg C).
6. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Control equipment and sequence of operation are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."

B. Thermostat: Wall mounted thermostat. Provide auto changeover.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

F. Coil guard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base that is 4 inches (100 mm) larger, on each side, than unit.

3.2 CONNECTIONS

A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. 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.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF DUCTLESS SPLIT-SYSTEM AIR-CONDITIONING UNITS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15815

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Double-wall round and flat-oval ducts and fittings.
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and support.

B. Related Sections:

1. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

2. Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 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. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.3 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.

2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.

3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

D. Welding certificates.

E. Field quality-control reports

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.

3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lindab Inc.

b. McGill AirFlow LLC.

c. SEMCO Incorporated.

d. Sheet Metal Connectors, Inc.

e. Spiral Manufacturing Co., Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.

2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60 (Z180).

2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 DUCT LINER

A. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA Inc.

b. Armacell LLC.

c. Rubatex International, LLC

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

a. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

3. Butt transverse joints without gaps, and coat joint with adhesive.

4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).

7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.

8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 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. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 4 inches (102 mm).

3. Sealant: Modified styrene acrylic.

4. Water resistant.

5. Mold and mildew resistant.

6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.

7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

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.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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 (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) 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.

2.6 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 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "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.

PART 3 - EXECUTION

3.1 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 round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for

branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 15 Section "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than2-Inch wg (500 Pa): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg (500 Pa) and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
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 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and

supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 15 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.7 START UP

A. Air Balance: Comply with requirements in Division 15 Section "Testing, Adjusting, and Balancing."

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel.

B. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units:
    a. Pressure Class: Positive 4-inch wg (750 Pa).
    b. Minimum SMACNA Seal Class: A.
    c. SMACNA Leakage Class for Rectangular: 6.
    d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Return and Air Ducts:

1. Ducts Connected to Air-Handling Units:
    a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 6.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 3.

d. SMACNA Leakage Class for Round and Flat Oval: 3.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg (250 Pa).

b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.

c. SMACNA Leakage Class for Rectangular: 12.

d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Outdoor-Air Ducts:

F.

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

b. Minimum SMACNA Seal Class: A.

c. SMACNA Leakage Class for Rectangular: 6.

d. SMACNA Leakage Class for Round and Flat Oval: 3.

G. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

H. Liner:

1. Supply Air Ducts: Flexible elastomeric, 1 inch (25 mm) thick.

a. 20’ downstream AHU.

b. Exposed ductwork (double wall).

2. Return Air Ducts: Flexible elastomeric, 1 inch (25 mm) thick.

a. 20’ upstream AHU.

b. Exposed ductwork (double wall).

3. Exhaust Air Duct: None.

I. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

    a. Velocity 1000 fpm (5 m/s) or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

        2) Mitered Type RE 4 without vanes.

    b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.

        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.

        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

    c. Velocity 1500 fpm (7.6 m/s) or Higher:

        1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

        2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

        1) Radius-to Diameter Ratio: 1.5.

    b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.

    c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Welded.

J. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.

b. Rectangular Main to Round Branch: Rectangular to round with standoff quadrant.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing ducts.

   a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.

   b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.

   c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF METAL DUCTS

SECTION 15820

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Flexible ducts.
10. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.

b. Manual volume damper installations.

c. Control damper installations.

d. Fire-damper installations, including sleeves; and duct-mounted access doors.

e. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with

NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).

2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Ruskin Company.
5. SEMCO Incorporated.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 1-inch wg (0.25 kPa).

E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
   a. Sleeve Thickness: 20-gage (1.0-mm) minimum.
   b. Sleeve Length: 6 inches (152 mm) minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel.
8. Screen Type: Insect.
9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Warming and Ventilating; a division of Mestek, Inc.
   b. Flexmaster U.S.A., Inc.
   c. METALAIRE, Inc.
   d. Nailor Industries Inc.

e. Ruskin Company.

2. Standard leakage rating.

3. Suitable for horizontal or vertical applications.

4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.

b. Mitered and welded corners.

c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.

b. Parallel- or opposed-blade design.

c. Stiffen damper blades for stability.

d. Galvanized steel, 0.064 inch (1.62 mm) thick.

6. Blade Axles: Galvanized steel.

7. Bearings:

a. Oil-impregnated bronze.

b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.

2. Arrow United Industries; a division of Mestek, Inc.

3. Flexmaster U.S.A., Inc.

4. Greenheck Fan Corporation.

5. METALAIRE, Inc.

6. Nailor Industries Inc.

7. Ruskin Company.

8. Young Regulator Company.

B. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
3. Mitered and welded corners.

C. Blades:

1. Multiple blade with maximum blade width of 8 inches (200 mm).
2. Parallel- and opposed-blade design.
3. Aluminum.
4. 0.064 inch (1.62 mm) thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch- (13-mm-) diameter; aluminum; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

E. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. Prefco; Perfect Air Control, Inc.
7. Ruskin Company.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.

2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.

3. METALAIRE, Inc.
4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 36 inches wide and double wall for larger dimensions.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Ventfabrics, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.

b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.

c. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Number of Hinges and Locks:
   a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.

b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.

c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside handles.

d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

2. Flame Gard, Inc.

3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch (1.3-mm) carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Vent fabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.11 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2004.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Connect ducts to duct silencers rigidly.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.

2. Upstream from duct filters.

3. At outdoor-air intakes and mixed-air plenums.

4. At drain pans and seals.

5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.

7. At each change in direction and at maximum 50-foot (15-m) spacing.

8. Upstream from turning vanes.

9. Control devices requiring inspection.

10. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).

2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).

3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

L. Label access doors according to Division 15 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.

P. Connect diffusers or light troffer boots to ducts with maximum 48-inch lengths of flexible duct clamped or strapped in place.

Q. Connect flexible ducts to metal ducts with draw bands.

R. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

4. Inspect turning vanes for proper and secure installation.

END OF DUCT ACCESSORIES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15838

HVAC POWER VENTILATORS

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. Ceiling-mounted ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilator fans to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: Two set(s) for each belt-driven unit.

1.7 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. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

1.9 WARRANTY

A. Warranty shall include replacing any defective parts or units within 10 years of the Beneficial Occupancy date.

B. The electric motor, electronic components of the fan, motor drive, variable frequency drive, and controller shall be replaced within 7 years of the Beneficial Occupancy date**.**

C. Labor for replacing any of the defective components shall be warrantied for a period of within 1 year from the Beneficial Occupancy date.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Housing: Steel, lined with acoustical insulation.

B. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

C. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

D. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.

3. Isolation: Rubber-in-shear vibration isolators.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in section.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

C. Severe duty: As indicated on the plans.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Ceiling Units: Suspend units from structure; use factory vibration isolation kit.

C. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch (25 mm).

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Section 15077 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Adjust belt tension.

6. Adjust damper linkages for proper damper operation.

7. Verify lubrication for bearings and other moving parts.

8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

9. Disable automatic temperature-control operators, energize motor, adjust fan to indicated rpm, and measure and record motor voltage and amperage.

10. Shut unit down and reconnect automatic temperature-control operators.

11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Comply with requirements in Section 15950 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

END OF HVAC POWER VENTILATORS

SECTION 15855

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.

2. Adjustable bar registers.

3. Fixed face registers.

B. Related Sections:

1. Division 10 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.

2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.

2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design

requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. 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.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF DIFFUSERS, REGISTERS AND GRILLES

SECTION 15900

HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Furnish and install a complete system of automatic temperature controls, as specified herein, as shown on the drawings, and as required for a complete installation. All temperature control equipment shall be of the electric type.

1.2 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS

A. Approved Control System Contractors and Manufacturers: Schneider Electric (Albireo Energy), Trane, Automated Logic (Gulf States Automation) and Honeywell. Control work shall be installed by a Control Contractor with minimum 5-years experience.

PART 2 - PRODUCTS

2.1 SPLIT SYSTEM HEAT PUMP CONTROL EQUIPMENT AND SYSTEMS

A. Thermostats (T): Shall be Honeywell Vision Pro 8000 series or approved equal.

1. Supply Input Voltage: 24 V AC 50/60Hz ±15%
2. Input Voltage: 0-10 VDC
3. Input Type: Dry contact 2, Analog 5
4. Temperature Sensor Type: 10kOhm T2 NTC thermistor
5. Accuracy: Temperature ±0.5°C, Humidity ±5%, 20-80% RH
6. Output Voltage: 24V AC/DC relay output 0-10V AC/DC voltage output.
7. Output Type: 5 relay output, 4 universal.
8. Communication port protocol: BACnet/MS/TP, Modbus RTU, Zigbee Pro

B. Carbon Dioxide (CO2) Sensors: Shall be Senva CT1R-A3D or approved equal.

1. Power Supply: 12-30 VDC / 24 VAC, 100mA max.
2. Analog Output: 3-wire 4-10mA and 0-5V/0-10V (dip switch selectable)
3. Digital Setpoint Output: Solid State, 1A @ 30VAC/DC, N.O.
4. Sensor Type: Non-dispersive infrared (NDIR)
5. Accuracy: ±(30ppm +3%reading)(400-2000ppm),@-10-50°C
6. Range: 0-2000/5000ppm: Programmable up to 10,000ppm
7. Response Time: 60s to 90% reading

C. Humidity (H) Sensors: Shall be Veris HW2L or approved equal.

1. Power Supply: Class 2; 20 to 30 VDC, 24 VAC, 50 to 60 Hz
2. Analog Output: Selectable 4 to 20 mA, 0 to 5 V, 0 to 10 V
3. Digital Setpoint Output: 0 to 10 V Output, Scale: 50 to 95°F/32 to 122°F

4. Sensor Type: Thin-film capacitive, replaceable
5. Accuracy: ±2% from 10 to 80% RH @ 77°F
6. Range: 0 to 100% RH

D. Control Damper: Shall be furnished by temperature control contractor. See "Motor Operated Volume Damper" specification. Ruskin CD40 or approved equal.

E. Control Damper Actuators:

1. Electronic damper operators: shall be two positions direct coupled with spring return. Belimo or equivalent.
2. Motors: shall be low voltage synchronous type and shall be non-overloading at a continuous stall.
3. Actuators: shall be selected, mounted, and tested for proper operation based on size, type, and torque requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface with Other Work:

1. Calibrate room thermostats as required during air test & balance.

2. Instruct air test & balance personnel in proper use and setting of control system components.

B. Run wiring in conduit in exposed areas. No exceptions.

C. Safety Controls:

1. Mount smoke detector in supply ducts of each ducted heating and/or cooling system and interlock to keep heating and cooling from operating if detector is energized.

2. Interlock electric heaters with cooling compressors and supply air fan.

3. Check high limit thermostats furnished with heating equipment for correct operation. Electric heaters shall cut-off when duct temperature exceeds high limit setting.

4. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.

D. Provide adjustable time delay timer for each AC system to offset unit starts.

E. Mount damper actuators and actuator linkages external of air flow.

F. Provide fresh battery in each thermostat and instruct owner in battery replacement.

G. Paste copy of record control wiring diagram on back of relay panel door cover for each heat pump system.

H. Manufacturer's Field Service:

1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-final inspection.

I. Program thermostats per owner's request time schedule.

END OF HVAC INSTRUMENATION AND CONTROLS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 15940

SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. See Division 15 Section "HVAC Instrumentation and Controls" for control equipment and devices and for submittal requirements.

1.2 CONTROL SEQUENCES

A. Constant Volume Split System Heat Pump Units:

1. Each Split System Heat Pump Unit shall be started and stopped by a 7-Day Programma ble Touch Screen Thermostat – (Honeywell Vision Pro 8000 Series Programmable Wall Thermostat).

2. When the Thermostat activates the unit, the fan shall start, and the room sensor shall control the unit. The Thermostat shall stage the DX cooling or heat pump heat and electric heat to maintain temperature setpoint. An emergency heat switch shall activate the electric heat if required. When the Thermostat de-activates the unit, the fan shall stop, and the outdoor air damper shall close.

3. Each heat pump shall have a low limit and high limit sensor for sequencing. On a drop in space temperature below 55° F. (adj.) the heat pump shall cycle the heat pump until space temperature reaches 60° F (adj.). On a rise in space temperature above 85°F (adj.) the heat pump shall start the DX cooling and run until space temperature reaches 80°F (adj.).

4. Outdoor Air: When unit runs in occupied mode, the O.A. damper shall open to maximum position and the return damper shall close to minimum position. When unit runs in unoccupied mode, the O.A. damper shall close, and the return air damper shall open to maximum position. CO2 Sensors – When CO2 level reaches 900 ppm, the O.A. damper shall open to maximum position and the return damper shall close to minimum position. When CO2 level drops below 900 ppm, the O.A. damper shall close to minimum position and the return air damper shall open to maximum position.

B. Ceiling Mounted Exhaust Fans: Each fan shall be interlocked/controlled as indicated in Exhaust Fan Schedule. Provide a manual motor starter with an "Off-On" switch at each fan. See electrical drawings for switch location.

C. Ductless Heat Pump/Air Conditioning Units:
1. A wired remote mounted thermostat (shall be of same manufacturer as unit) shall cycle the mechanical cooling to maintain setpoint. Conceal all wiring in walls.
2. On a call for cooling, the thermostat shall cycle the mechanical cooling to maintain setpoint.
3. Adjustable cooling setpoints shall control space temperature by activating the cooling equipment.

4. Pipe condensate to indirect drain provide by plumbing contractor (some will be piped to drywells on grade). Provide condensate pump as required integral to unit. Exposed condensate pumps or piping will not be accepted.

D. Fire Alarm Control: Upon receipt of an alarm from the building fire alarm system, all AC units shall be shut down.

E. Operational Schedules: Obtain yearly operational schedule from Owner. If no schedule can be confirmed, program controller to place all equipment into occupied mode from 6:00 am to 6:00 am, Monday through Friday, with the exception of holidays.

F. Dehumidifiers: Dehumidifier shall be controlled by factory mounted adjustable airtime cycle and air dryness levels (humidistats).

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SEQUENCE OF OPERATION

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Balancing constant volume Air Systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Submit Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Submit Certified TAB reports.

C. Submit sample report forms.

D. Submit instrument calibration reports, to include the following:
1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 COORDINATION

A. Notice: Provide three days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage one of the following:

B. 1. Southeast T&B.

C. 2. Superior TABs.

D. 3. System Analysis.

E. 4. Performance Testing and Balancing.

3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Airside:
    a. Permanent electrical-power wiring is complete.

b. Automatic temperature-control systems are operational.

c. Fans are operating free of vibration and rotating in correct direction.

d. Equipment and duct access doors are securely closed.

e. Balance and fire dampers are open.

f. Isolating and balancing valves are open and control valves are operational.

g. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

h. Windows and doors can be closed so indicated conditions for system operations can be met.

2. Hydronics:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.

b. Piping is complete.

c. Water treatment is complete.

d. Systems are flushed, filled, and air purged.

e. Strainers are pulled and cleaned.

f. Control valves are functioning per the sequence of operation.

g. Shutoff and balance valves have been verified to be 100 percent open.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 15 Section "Duct Accessories."

3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 15 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) and metric (SI) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Division 15 Section "Metal Ducts."

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at the first coil connected to the end of system. Check the sum of branch-circuit flows against the approved pump flow rate to the building. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems’ “as-built” piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Set system controls so automatic control valves are wide open to heat exchangers.
3. Check air vents for forceful liquid flow exiting from vents when manually operated.

3.7

3.8 PROCEDURES FOR MOTORS

A. Motors, ½ 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. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:
1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drops.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drops.

L. Measure, adjust, and record the following data for each electric heating coil:
1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each refrigerant coil:
1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressures drop.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.11 FINAL REPORT

M. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans 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. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.

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. Sheaves make, size in inches (mm), and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.
2. Motor Data:
    a. Motors make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.

e. Sheaves make, size in inches (mm), and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm (L/s).

b. Total system static pressure in inches wg (Pa).

c. Fan rpm.

d. Filter static-pressure differential in inches wg (Pa).

e. Cooling-coil static-pressure differential in inches wg (Pa).

f. Outdoor airflow in cfm (L/s).

g. Return airflow in cfm (L/s).

h. Outdoor-air damper position.

i. Return-air damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.

b. Location.

c. Coil type.

d. Number of rows.

e. Fin spacing in fins per inch (mm) o.c.

f. Make and model number.

g. Face area in sq. ft. (sq. m).

h. Tube size in NPS (DN).

i. Tube and fin materials.

j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

l. Air flow rate in cfm (L/s).

m. Average face velocity in fpm (m/s).

n. Air pressure drops in inches wg (Pa).

o. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).

p. Return-air, wet- and dry-bulb temperatures in deg F (deg C).

q. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).

r. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).

s. Water flow rate in gpm (L/s).

t. Water pressure differential in feet of head or psig (kPa).

u. Entering-water temperature in deg F (deg C).

v. Leaving-water temperature in deg F (deg C).

G. 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. Sheaves make, size in inches (mm), and bore.

h. Center-to-center dimensions of sheave, and number of adjustments in inches (mm).

2. Motor Data:

a. Motors make, and frame type and size.

b. Horsepower and rpm.

c. Volts, phase, and hertz.

d. Full-load amperage and service factor.

e. Sheaves make, size in inches (mm), and bore.

f. Center-to-center dimensions of sheave, and number of adjustments in inches (mm).

g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).

b. Total system static pressure in inches wg (Pa).

c. Fan rpm.

d. Suction static pressure in inches wg (Pa).

H. Gas Heat Apparatus Test Reports: In addition to 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 (kW).

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. Sheaves make, size in inches (mm), and bore.

n. Center-to center dimensions of sheave and number of adjustments in inches (mm).

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).

b. Entering-air temperature in deg F (def C).

c. Leaving-air temperature differential in deg F (deg C).

d. Air temperature differential in deg F (deg C).

e. Entering-air static pressure in inches wg (Pa).

f. Leaving-air static pressure in inches wg (Pa).

g. Air static-pressure differential in inches wg (Pa).

h. Low-fire fuel input in Btu/h (kW).

i. High-fire fuel input in Btu/h (kW).

j. Manifold pressure in psig (kPa).

k. High-temperature-limit setting in deg F (deg C).

l. Operating set point in Btu/h (kW).

m. Motor voltage at each connection.

n. Motor amperage for each phase.

o. Heating value of fuel in Btu/h (kW).

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.

b. Location and zone.

c. Traverse air temperature in deg F (deg C).

d. Duct static pressure in inches wg (Pa).

e. Duct size in inches (mm).

f. Duct area in sq. ft. (sq. m).

g. Indicated air flow rate in cfm (L/s).

h. Indicated velocity in fpm (m/s).

i. Actual air flow rate in cfm (L/s).

j. Actual average velocity in fpm (m/s).

N. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.

b. Serial number.

c. Application.

d. Dates of use.

e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection

1. After testing and balancing are complete, operate system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by the Engineer.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

2. If the second final inspection also fails, Government may contract the services to another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Season Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF TESTING, ADJUSTING AND BALANCING

THIS PAGE INTENTIONALLY LEFT BLANK

DIVISION 16

ELECTRICAL SPECIFICATIONS

PREPARED BY



John Averrett, PE

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16000

ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work under this item of the Contract shall include the furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete electrical systems, including exterior and interior of buildings as shown on the drawings and specified herein.

B. The CONTRACTOR shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by the manufacturer, trade name, or catalog number establishes the quality standards of materials and equipment required for this installation and is not intended to exclude products equal in quality and similar in design. Where two or more designations are listed, choice shall be optional with the Contractor. The Engineer reserves the sole right to decide the equality of materials proposed for use in lieu of those specified.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
1. Section 02200 – Earthwork
2. Section 09900 – Painting
3. Division 11 - Equipment
4. Division 15 – Mechanical

1.3 CODES, PERMITS, AND INSPECTIONS

A. Comply with applicable laws of the community, with latest edition of NEC where not in conflict with those laws, and with the service rules of the local utility company. Obtain and pay for all permits required. After completion of the work, submit certificate of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.4 DRAWINGS AND SPECIFICATIONS

A. Consider as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Engineer in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions; verify all dimensions and existing conditions.

1.5 CONFLICTS, COORDINATION AND CHANGES

A. In the event that interferences or conflicts develop, the ENGINEER shall decide which equipment shall be relocated regardless of which was first installed. In the interest of avoiding such conflicts, the electrical sub-contractor who is using common space such as mechanical rooms, chases, ceiling space, etc., shall coordinate his work with all other trades and other parts of his own work. If, during this coordination, it is discovered that necessary or desirable changes should be made, advise the ENGINEER and secure his decision in writing.

1.6 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's product specifications, standard details, certified product test results, installation instructions, accessories and general recommendations, as applicable to materials and finishes for each component.

C. Samples: Provide samples indicated in each Section, representative of products and/or components to be provided.

D. Color Selection: Where a color selection is required and is not preselected, include physical samples of materials and full range of colors available at bid date.

E. Shop Drawings: Provide shop drawings where indicated or otherwise required for complete and proper illustration of products, systems and installation, including in part, showing layouts, details, elevations, edge conditions, joints, corners, profiles, supports, anchorages, trim, flashings, closures, accessories, special details and similar conditions. Distinguish between factory and field assembly work. The manufacturer's technical engineering department shall approve the drawings before they are submitted.

F. Qualification data for manufacturer, Design Engineer, fabricator and installer.

G. Sample of warranties specified and of incidental warranties of components, which are all to be extended to the Owner.

1.7 WARRANTY

A. Warrant the entire electrical system in proper working order. Replace, without additional charge, all work or material which may develop defects (ordinary wear and tear or damage resulting from improper handling excepted) within a period of one year from date of final acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall be new and shall be listed as approved by the Underwriter's Laboratories, Inc. in every case where a standard has been established for the particular type of material in question. All work shall be executed in workmanlike manner and shall present a neat and mechanical appearance when completed.

2.2 ELECTRICAL SERVICE

A. General: Coordinate with owner. Provide all material and labor so as to produce a complete installation meeting the owner regulations. The Electrical Contractor shall be responsible for including all fees associated with bringing power to this site in their original bid.

B. Metering: Obtain metering equipment from Utility Company and install in compliance with the Utility Company's requirements.

C. Main Service Equipment: Provide U.L. listed service entrance components as shown or specified hereinafter.

D. Service Feeder: Of type and size shown on Riser Diagram. Extend (2)5" PVC with Poly-Pull 48" deep underground from service equipment to transformer location (verify exact location with Utility Company). Install utility furnished pull boxes as shown on drawings and terminate conduit at transformer as directed by the Utility Company and leave sufficient slack conductors for connection to transformer lugs. Coordinate any increase or decrease in service size with utility.

E. Transformer: Will be furnished and installed by Utility Company on concrete pad for underground service. Installation shall be in accordance with Utility Company standard drawings. Provide connectors as directed by Utility Company for terminating feeder at transformer lugs. Coordinate any increase or decrease in transformer size with utility.

PART 3 - EXECUTION

3.1 VISIT TO SITE

A. Before submitting a bid, visit the site and ascertain all existing conditions. Make such adjustments in work as are required by the actual conditions encountered.

3.2 CUTTING AND CHASING

A. Where possible all work shall be built in as the job progresses. Where this is not possible, secure approval and do necessary cutting, chasing, etc. required. Do not cut through any structural members without securing approval in advance; such holes shall be neatly cut or drilled – not chipped.

3.3 TRENCHING AND BACKFILLING

A. Do all excavating necessary for installation of work; backfill trenches and excavations after work has been installed and inspected. Backfill within the building and under paved areas shall meet compaction requirements and fill material shall be pit run gravel or similar granular material.

3.4 ELECTRICAL SERVICE INSTALLATION

A. Project Conditions: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated.

B. Notify Project Manager and Owner no fewer than seven days in advance of proposed interruption of electrical service.

C. Indicate method of providing temporary electrical service.

D. Do not proceed with interruption of electrical service without Project Manager's written permission.

END OF ELECTRICAL

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16050

GENERAL ITEMS

PART 1 - GENERAL

1.1 SCOPE:

A. The intent of these specifications and accompanying drawings is to describe and provide for all labor, equipment, and materials necessary for a complete installation of electrical wiring.

B. The drawings and specifications shall be considered as complementary one to the other, so that materials and workmanship indicated, called for or implied by one and not the other shall be supplied and installed as though specifically called for by both. Omissions from the drawings and specifications or the misdescription of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed shall not relieve the Electrical Contractor from performing said work. In any case of conflicting or incorrect information, the matter shall be submitted to the Architect who shall make a deposition in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. These electrical drawings are diagrammatical only. Do not scale these drawings.

C. For the purpose of these documents (Electrical Specs and drawings) the following definitions shall apply:

Exposed - Conduit or other equipment installed such that it is visible on finished walls, finished ceilings or structure.
Concealed - Conduit or other equipment installed such that it is not visible without removing building finishes.

1.2 WORK REQUIRED:

A. Furnish labor and materials to complete electric work as shown on drawings or herein specified. Work shall consist of but shall not be limited to the following:

1. Complete electric light and power system.

2. Connection of all switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, lighting fixtures, and/or any other equipment forming a part of the electrical system.

3. Provide complete fire alarm system.

4. Connection of electrical equipment mentioned in this section or noted on drawings, whether furnished by Electrical contractor or others.

5. Installation of all starters. Except where specified otherwise starters will be furnished by Mechanical Contractor or Plumbing contractor or furnished integral with equipment.

6. Installation and furnishing of disconnect and safety switches.

7. Power wiring and connection of starters and motors, including control wiring where indicated on plans.

1.3 VISIT TO SITE:

A. All bidders shall visit the site and thoroughly familiarize themselves with the existing conditions before submitting their bids. Failure to investigate the conditions will not under any circumstances relieve the Electrical Contractor of any responsibility under the contract. Contractor shall notify the Architect/Engineer, prior to bid, of any conflicts or discrepancies in drawings or specifications so an addendum can be issued.

1.4 PROGRESS:

A. Electrical Contractor shall coordinate his work so as to conform to progress of the work of other trades.

1.5 CODES, PERMITS, AND ORDINANCES:

A. This contractor shall comply with all state laws and regulations applicable to electrical installations, and shall obtain all permits necessary for its installation paying all fees in connection there with.

B. All electrical work and material shall conform to the following codes and regulations:

1. The latest edition of N.E.C. and amendments, as adopted by local authority.

2. Requirements of the state and local city code authorities.

3. Requirements of the local utility companies.

4. Requirements of the local telephone company.

5. National Electrical Manufacturer's Association.

6. Requirements of National Fire Protection Association Codes.

5. Requirements of International Building Code, as adopted by local authority.

1.6 PROTECTION OF EQUIPMENT AND STORAGE OF MATERIALS:

A. The Electrical Contractor shall be responsible at all times for all work damaged by him in executing his contract, and any work damaged shall be replaced, and placed in proper working condition at no additional cost to Owner.

B. The construction premises shall be kept clean and free of scrap materials at all times. The General Contractor shall designate the storage space at the site and/or in the building and the Electrical Contractor shall be responsible for the storage of his tools and materials.

1.7 GUARANTEE AND APPROVAL:

A. The electrical installation shall be made by competent mechanics, under the supervision of a full-time foreman, all of whom shall be duly certified by local authorities. The entire installation shall be subject to the Architect's constant inspection final approval, and acceptance.

B. Furnish the Architect with a written guarantee countersigned by the General Contractor, stating that if any workmanship or material executed under this section proves defective within one (1) year after final acceptance, such defects and all other work damaged thereby will be made good by him without charge to the Owner.

1.8 STANDARDS OF MATERIAL AND WORKMANSHIP:

A. All materials and equipment shall be new and shall be listed as approved by the Underwriter's Laboratories, Inc. in every case where a standard has been established for the particular type of material in question. This requirement applies to all sections of Division 16 in these specifications.

B. All work required under this section shall be first class in all respects with particular emphasis on neatness and workmanship. The Architect and/or Engineer will judge the quality of workmanship.

C. The Electrical Contractor shall base his proposal on the materials specified herein and on the plans. Reference to a particular product by the manufacturer, trade name or catalog number establishes the quality standards of materials and equipment required for this installation and is not intended to exclude products equivalent in quality and similar in design. Materials recognized by the National Electrical Manufacturer's Association as equivalent to those specified will be accepted. The electrical contractor must obtain, ten (10) days prior to bid, written approval of any substitutions which he proposes to make. The Engineer reserves the right to decide the equality of proposed equivalents in lieu of those specified.

1.9 ALLOWANCES:

A. Make allowance in bid for moving, prior to installation or during rough-in, any lighting fixture, wiring device, fusible disconnect switch, motor controller, power or lighting panelboard or equipment item (whether furnished by this Contractor or others) and requiring electrical connections a distance of 6'-0" or less from the locations shown on the drawings without additional cost to the Owner as a result of job conditions or Architect's request.

B. Contractor shall coordinate specifically exact location of electrical equipment prior to installation to avoid conflict with other trades. Any conflicts shall be brought to the Architect’s attention so that the conflict can be properly resolved.

1.10 TESTING AND BALANCING:

A. Make any tests, which may be required by the Inspection Agencies having jurisdiction thereof, the Owner or the Architect, in connection with the operation of the Electrical Systems to the buildings.

B. Balance all electrical loads connected to 3 phase secondary distribution panelboards and power transformers to insure an approximately equivalent distribution of load on all 3 phase primary and secondary conductors serving same.

1.11 SHOP DRAWINGS AND SUBMITTAL DATA:

A. The Contractor shall submit a list of items proposed for use. He shall also submit catalog data and shop drawings on proposed systems and their components, panelboards, safety switches, starters and contactors, transformers, lighting fixtures, floor boxes, time switches, and wiring devices and plates. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Contractor shall review and approve shop drawings and data prior to submission to Architect. Data shall be submitted within thirty (30) days after the contract is awarded. Provide six (6) copies of shop drawings as a minimum unless greater number of copies is required by the General Conditions. Each submittal data section shall be covered with an index sheet listing Contractor, supplier, etc., and an index to the enclosed submittals.

B. Each major section of submittals such as power equipment, lighting equipment, fire alarm, intercom, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:

1. General contractor with phone number and project manager.

2. Sub-contractor with phone number and project manager.

3. Supplier of equipment with phone number and person responsible for this project.

4. Index of each item covered in submittal and model number as proposed in the attached.

5. Any deviation from contract documents shall be specifically noted on submittal cover index and boldly on specific submittal sheet.

6. Any of the above information not included with submittals may result in the entire package being returned and not reviewed.

C. Each section of submittal will be furnished complete. Incomplete sections will not be reviewed and will be returned.

D. Contractor shall review approved shop drawings and submittal data in detail. Electrical plans are diagrammatical. Contractor shall adjust equipment locations and electrical connection requirements as indicated in approved shop drawings.

E. Electrical contractor shall submit written verification that he has coordinated all electrical requirements for HVAC and plumbing equipment with mechanical and plumbing subcontractors. Written document shall indicate any difference between design requirements and actual verified requirements and shall recommend solutions to any conflicts found.
NOTE: Electrical submittals will be returned if this document is not included.

F. Electrical contractor shall submit drawings, to scale (¼" = 1'), showing layout of proposed equipment in electrical rooms or electrical spaces. Drawings shall show panelboards, switchboards, disconnect switches, transformers, HVAC units, plumbing equipment, etc.

Drawings shall indicate actual dimensions of equipment to be used on this project. Proper clearances, in accordance with the National Electrical Code, must be maintained.

1.12 PROJECT CLOSE-OUT:

A. Prior to issuance of certificate for final payment, submit to architect and obtain his approval of the following:

1. Record Drawings (As-Builts): Provide record drawings showing all revisions to contract documents including addenda and change orders.

2. Written certification of any special systems including, but not limited to, fire alarm and intercom (3 copies).

3. Equipment operating and maintenance manuals (3 copies).

4. Equipment submittal data (3 copies).

5. Equipment and system warranty dates and guarantee (3 copies).

6. Recommended maintenance schedule for equipment and systems (3 copies).

7. List of owner's personnel with signatures indicating who has received training and operating instructions for each electrical system or special equipment (3 copies).

8. Test Results or start-up report for any equipment or special systems (3 copies).

1.13 SPECIAL TRAINING:

A. Contractor shall explain and demonstrate all systems to owner's representative. Contractor shall obtain signature of approved owner's representative on a document indicating that he is satisfied with explanation and demonstration of all electrical systems.

B. After completion of work, contractor shall provide special training and operating instructions for each system. This training and instruction shall be as necessary for owner's representative to be familiar with system operation but shall not be more than eight (8) hours for any one system.

C. Special training shall be provided for the following systems:

1. General Electrical – Light fixtures and lamps, lighting controls, panelboards, transformers, etc.
2. Fire Alarm System.

D. After training and instruction is complete and owner is satisfied, provide a document for each system stating owner has received special training and instruction and is completely satisfied with his understanding of system operation. Have owner's representative sign this document and submit with project close-out information.

1.14 ELECTRICAL SERVICE:

A. Service shall extend from main panel underground to padmount transformer as shown on drawings. The service voltage shall be as shown on plans.

B. Coordinate with utility company. Provide all material and labor not supplied by the utility company so as to produce a complete installation meeting the utility regulations. Contractor shall include in his bid and pay any charge by utility company for electrical service.

Contractor shall be responsible for the following:

1. Furnish and install two 5" schedule 40 PVC conduits 42" deep for underground primary.

2. Furnish and install concrete pad for transformer per utility company specifications.

3. Furnish and install underground secondary service feeder from padmount transformer or transclosure to main panel.

4. Furnish and install one 1-1/4" conduit from transformer to meter.

5. Install meter socket furnished by utility company.

C. It shall be the responsibility of this contractor to reaffirm with utility company representatives that the location arrangement voltage, phase and connections are coordinated with and in accordance to their requirements. If their requirements are at variance with these drawings or specifications, the contract price shall include any additional costs necessary to meet those requirements without extra cost to the owner after a contract is entered into. Contractor shall include in his bid any service charges from utility company associated with electrical service method specified. Should no cost be available from the utility company the electrical contractor shall include with his bid a letter from the utility company stating the same, and then this charge shall not be included in the contractor's bid price. No additional charges shall be incurred by owner in connection with these services, except as noted above.

D. Service equipment shall be legibly marked in the field with the maximum available fault current. The field markings shall include the date the fault current calculation was performed and shall be of sufficient durability to withstand the environment involved. **Contractor is responsible for calculation and proper markings and must comply with latest edition of NEC 110.24.** Field marking shall utilize the same method as panelboard nameplates or labels and shall be on outside cover of Nema 1 panels and on inside of Nema 3R panels.

1.15 HEATING AND AIR CONDITIONING:

A. The Electrical Contractor shall furnish all branch circuit wiring to motors, exhaust fans, unit heaters, and air handling units as shown on the drawings to provide a complete system of wiring for power. Control equipment and control circuit wiring which is not shown on Electrical Plan will be by the Heating and Air Conditioning Contractor. Provide control conduits as shown on plan with pullwires where empty and with wire when indicated.

B. Starters shall be furnished by Mechanical or Plumbing Contractor or shall be an integral part of equipment. Where loose starters are furnished, electrical contractor shall install and wire starters for proper operation even if not specifically shown on drawings. Starters in motor control centers shall be furnished and installed by electrical contractor.

C. All wiring on exterior of building shall be in rigid galvanized conduit or liquid-tight flexible steel conduit and shall be completely waterproofed.

D. Thermostat outlets shall be furnished and installed by Mechanical Contractor.

E. Should the manufacturer's data of the equipment furnished on the job indicate circuit breaker protection meets their requirements then non-fused disconnect switches will be acceptable as per local codes and ordinances. If the manufacturer's data indicates that fuses are required, then the disconnect switches shall be fused type. Electrical Contractor must verify this with Mechanical Contractor.

F. Electrical contractor shall coordinate exact electrical wiring requirements for HVAC and plumbing equipment with Mechanical and Plumbing subcontractors prior to rough-in being done.

Electrical contractor shall submit (along with shop drawings) written verification that he has coordinated all electrical requirements for HVAC and plumbing equipment with mechanical and plumbing subcontractors. Written document shall indicate any difference between design requirements and actual verified requirements and shall recommend solutions to any conflicts found.
NOTE: Electrical submittals will be returned if this document is not included.

G. Electrical contractor shall coordinate exact layout of HVAC equipment in mechanical rooms, electrical rooms, storage rooms, etc. with mechanical contractor to avoid conflicts with electrical equipment. Contractor shall adjust electrical equipment locations slightly to achieve adequate space and proper clearance requirements. Severe conflicts shall be brought to Architect’s attention for a resolution.

H. Refer to detail on drawings for mounting of disconnect switch and specific wiring requirements at outdoor HVAC equipment.

1.16. EMPTY CONDUITS:

A. Where conduits in which no wiring is installed are indicated on the drawings, a #14 gauge galvanized iron pullwire shall be installed. Leave 18 inch free ends at all outlets, boxes, cabinets and terminations.

END OF GENERAL ITEMS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16060

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.
   1. Underground distribution grounding

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 – Electrical

1.3 SUBMITTALS

A. The CONTRACTOR shall submit product data as required in Section 16000.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, ¼ inch (6 mm) in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
   1. No. 4 AWG minimum, soft-drawn copper.
   2. Conductor Protector: Half-round PVC.

D. Grounding Bus: Rectangular bars of annealed copper, ¼ by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; ¾ inch by 10 feet; 20 feet in total length.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 1/0 AWG minimum.
   1. Bury at least 24 inches below grade.
   2. Duct-Bank Ground Conductor: Bury 12 inches above duct bank when indicated as part of duct-band installation.

C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus on insulated spacers 1 inch minimum, from wall 6 inches above finished floor, unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

D. Conductor Terminations and Connections
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors, unless otherwise indicated.
   3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Every Circuit shall contain an Insulated Equipment Grounding Conductor, whether required by NFPA or not.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet and central

equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 6 inches below finished floor or final grade, unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
   2. For grounding electrode system, install at least three rods spaced at least one rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolating Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure when indicated on plans: Install a drive ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod, extending around the perimeter of building (area or item indicated).

1. Install tinned-copper conductor not less than No. 3/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches from building foundation.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet ling, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.4 TESTING

A. Perform the following tests and inspections and prepare test reports:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.
a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by the fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 5 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify the ENGINEER promptly and include recommendations to reduce ground resistance.

END OF GROUNDING AND BONDING

SECTION 16073

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 - Electrical

1.4 SUBMITTALS

A. The CONTRACTOR shall submit product information as required in Section 16000.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. Fabco Plastics Wholesale Limited.
   d. Seasafe, Inc.
2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items shall be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: All members shall be galvanized or cadmium plated unless noted otherwise. Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used. Powder driven fasteners shall be used only where approved by ENGINEER.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: 4" Galvanized, "C" Channel, ¼" thick. All bolts, nuts, and washers shall be stainless steel unless otherwise noted on plans.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70, but no more than 8 feet. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with two-bolt conduit clamps, single-bolt conduit clamps, and single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete.

C. Anchor equipment to concrete base.
1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturers written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
1. Section 16000 – Electrical

1.3 SUBMITTALS

A. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:
1. Power Circuits: Black letters on a white field.
2. Legend: Indicate system or service and voltage.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 CONDUCTOR AND COMMUNICATION AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. All conductors (power and control) and cables shall be labeled at each termination and in all junction boxes with Panduct #SSM25-C cable tags.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
   1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.
   4. Printed legend shall indicate type of underground line.

B. Manufacturers:
   1. Vulcan utility signs and products.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

F. Marker Posts for Buried Lines: Fiberglass based composite marker developed to drive into soil while maintaining flexibility. The marker shall remain stable in temperatures from -300ºF to 1200ºF without softening in heat or becoming brittle in cold. The marker shall not rust, rot, or corrode and shall be able to absorb vehicular impact and return to original position. The marker shall not require painting, as the color is consistent throughout the material, and shall incorporate a UV inhibitor to stabilize the marker for longevity and color retention. The marker shall be able to withstand a controlled burn without melting. The marker shall contain large, clearly legible letters – "WARNING-UNDERGROUND BURIED CABLE" with smaller letters giving the name and telephone numbers for the designated contact entity. Coordinate with ENGINEER.
   1. Marker shall be DRV series by Vulcan Utility Signs & Products; Foley, Alabama. Toll free number: 1(800) 426-1314.

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed. Provide 4" x 6" laminated nameplates 3/8" high letters for the name of the panel or the name of the equipment served and ¼" high letters for the phase and color-code information. Nameplate shall be black core with white surface so that engraved letters appear black on a white background. Furnish list for approval. Apply with contact bond adhesive.

Example:

PANEL A
PHASE A – BROWN
PHASE B – ORANGE
PHASE C – YELLOW
NEUTRAL – GRAY
GROUND – GREEN

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength: 50 lb (22.6 kg), minimum.
   3. Temperature Range: Minus 40 to plus 185ºF (Minus 40 to plus 85ºC).

B. Provide Arc Flash warning labels on panelboards, MCCS, etc. required by NEC where not already provided by the manufacturer.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands:
   1. Fire Alarm System: Red.
   2. Fire-Suppression Supervisory and Control System: Red and yellow.
   3. Combined Fire Alarm and Security System: Red and blue.
   4. Security System: Blue and yellow.
   5. Mechanical and Electrical Supervisory System: Green and blue.
   6. Telecommunication System: Green and yellow.
   7. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholds use color-coding conductor tape and write-on tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape and write-on tags. Identify each ungrounded conductor according to source and circuit number.

E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
   1. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
      a. Power transfer switches.
      b. Controls with external control power connections.
   2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

H. Instruction Signs:
   1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
   2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Refer to 26C for example.
      b. Outdoor Equipment: Engraved, laminated acrylic or melamine label. Refer to 26C for example.
      c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Emergency system boxes and enclosures.
d. Disconnect switches.
e. Contactors.
f. Remote-controlled switches, dimmer modules, and control devices.
g. Voice and data cable terminal equipment.
h. Television/audio components, racks, and controls.
i. Fire-alarm control panel and annunciators.
j. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
k. Uninterruptible power supply equipment.
l. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

J. Short Circuit Labeling Instructions:

1. Field mark electrical service equipment with a conspicuous and permanent label that indicates the available fault current as shown on panel schedules. The field markings(s) shall include the date the fault current calculation was performed and be of sufficient durability to withstand the environment involved. Per NEC 110.24.
2. Electrical equipment that is likely to require examination, adjustment, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. Per NEC 110.16.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
1. Color shall be factory applied or for sizes larger than No. 1/0 AWG, if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:
a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
3. Colors for 480/277-V Circuits:
a. Phase A: Brown.
b. Phase B: Orange.

c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

END OF ELECTRICAL IDENTIFICATION

SECTION 16120

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
   3. Sleeves and sleeve seals for cables.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 – Electrical

1.3 SUBMITTALS

A. Product Data: Submit product data in accordance with Sections 01330 and Section 16000.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. American Insulated Wire Corp.; a Leviton Company.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.
   6. Carol Wire and Cable.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, XHHW, UF, USE, and SEOW.

D. Multiconductor Cable: Comply with NEMA WC 70 for Type SEOW and Type USE with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.

2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

C. Control Wiring: Copper. No. 14 AWG stranded minimum.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN, single conductors in raceway; Type XHHW, single conductors in raceway.

B. Exposed Feeders: Type THHN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN, single conductors in raceway.

E. Feeders installed below Raised Flooring: Type THHN, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN, single conductors in raceway.

H. Branch Circuits Concealed in Concrete and below Slabs-on-Grade and Underground: Type THHN, single conductors in raceway

I. Branch Circuits Installed below Raised Flooring: Type THHN, single conductors in raceway.

J. Class 1 Control Circuits: Type THHN, in raceway.

K. Class 2 Control Circuits: Type THHN, in raceway; Power-limited cable, concealed in building finishes.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

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

B. Make taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

END OF CONDUCTORS AND CABLES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16130

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 – Electrical

1.3 SUBMITTALS

A. Product Data: Submit in accordance with Section 01330 and Section 16000.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Alflex Inc.
   3. Allied Tube & Conduit; a Tyco International Ltd. Co.
   4. Anamet Electrical, Inc.; Anaconda Metal Hose.
   5. Electri-Flex Co.
   6. Manhattan/CDT/Cole-Flex.
   7. Maverick Tube Corporation.
   8. O-Z Gedney; Unit of General Signal.
   9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch (1mm), minimum.
   3. ETL Listed.

E. FMC: Zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

H. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. Certain Teed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

C. ENT: NEMA TC 13. Not allowed.

D. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

E. LFNC: UL 1660. Not allowed.

F. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: UL 514B. Not allowed.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by ENGINEER.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Thomas & Betts Corporation.
   b. Walker Systems, Inc.; Wiremold Company (The).
   c. Wiremold Company (The); Electrical Sales Division.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. Emerson/General Signal; Appleton Electric Company.
   3. Erickson Electrical Equipment Co.
   4. Hoffman.
   5. Hubbell, Inc.; Killark Electric Manufacturing Co. Division.
   6. O-Z/Gedney; Unit of General Signal.
   7. RACO; a Hubbell Company.
   8. Robroy Industries, Inc.; Enclosure Division.
   9. Scott Fetzer Co.; Adalet Division
   10. Spring City Electrical Manufacturing Co.
   11. Thomas & Betts Corporation.
   12. Walker Systems, Inc.; Wiremold Company (The).
   13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
   14. Rittal

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Ferrous alloy, Type FD with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Metal Floor Boxes: Cast metal, fully adjustable, semi-adjustable, rectangular.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access Pull and Junction Boxes: NEMA FB 1, cast aluminum or galvanized cast iron with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch, unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

I. Cabinets:
   1. NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
   1. Exposed: Rigid steel conduit.
   2. Concealed Conduit, Aboveground: Rigid steel conduit.
   3. Underground Conduit: RNC, Type EPC-40-PVC.
   4. Corrosive environments (pits, wetwell, headworks, aeration basins, etc) and as designated on plans: PVC coated galvanized rigid steel conduit.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC, Type UA only.
   6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4x as indicated on plans.
   7. Application of Handholes and Boxes for Underground Wiring:

a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.

B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed: Rigid steel conduit. Includes raceways in the following locations:
a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.
2. Concealed: in ceilings and Interior Walls and Partitions: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC Type UA only.
4. Damp or Wet Locations: Rigid steel conduit.
5. Corrosive environments (pits, wetwell, headworks, aeration basins, etc) and as designated on plans: PVC coated galvanized rigid steel conduit.
6. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: Riser type, optical fiber/communications cable raceway, rigid steel conduit.
7. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: Riser-type, optical fiber/communications cable raceway; Plenum-type, optical fiber/communications cable raceway, rigid steel conduit.
8. Boxes and Enclosures: NEMA 250, Type 1, Type 3R, Type 4x Stainless steel: As indicated on plans.

C. Minimum Raceway Size: 1/2-inch trade size, unless noted otherwise.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch seal all joints, nicks and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Section "Electrical Supports and Seismic Restraints”

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:
1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from RNC, Type EPC-40-PVC to rigid steel conduit for vertical turn before rising

above the floor. Use long radius 90s for conduit 1-1 ½" trade size and larger.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use woven polyester tape made from low friction, high abrasion restraint yarn with not less than 1800-lbs (816-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Tape shall be printed with sequential foot markings Carlon tape # TL 382 series.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
1. ¾-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet
3 Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway-sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway-sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement, and for transformers and motors.
1. Use LFMC Type UA in damp or wet locations.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF RACEWAYS AND BOXES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one 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.

D. Cord and Plug Connected Equipment: Coordinate with equipment supplier and match plug configuration of equipment supplied.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
1. Division 11 - Equipment
2. Section 16000 – Electrical

1.3 SUBMITTALS

A. Product Data: Submit data in accordance with Section 01330 and Section 16000.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; 5361I (single), 5362I (duplex) or equal by:
1) Cooper.
2) Hubbell.

3) Leviton.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1. NEMA WD 6, UL 498, and UL 943, Class A.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; 2094-I or equal by:
1) Cooper.

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: Thermoplastic Elastomer–Insulated, stranded-copper conductors, with Type SEOW jacket; with green-insulated grounding conductor and equipments-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 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; 20AC1-I (single pole), 20AC2-I (two pole), 20AC3-I (three way) 20AC4-I (four way).
1) Cooper.
2) Hubbell.
3) Leviton.

C. Pilot Light Switches, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; PS20AC1-RPL for 120 V and 277 V or equal by:
b. Cooper.
c. Hubbell.
d. Leviton.

D. Key-Operated Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; PS20AC1-L or equal by:
1) Cooper.
2) Hubbell.
3) Leviton.
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; 1251 or equal by:
1) Cooper.

2) Hubbell.
3) Leviton.

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; 1251L or equal by:
1) Cooper.
2) Hubbell.
3) Leviton.

2.6 COMMUNICATIONS OUTLETS

A. Telephone Outlet:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; S58-BL or equal by:
1) Cooper.
2) Leviton.
2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

B. Combination TV and Telephone Outlet:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pass & Seymour; S58 or equal by:
1) Cooper.
2) Leviton.
2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

2.7 WALL PLATES

A. Single and combination types to match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin finished 3oz. stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in “wet locations.”

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant extra duty metal with lockable cover, weatherproof while in use.
1. Products: Subject to Compliance with requirements, provide one of the following:
a. Pass & Seymour WIUCED10GDL (single gang) WIUCED20GL (double gang).

2.8 FINISHES

A. Color:
1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red
3. TVSS Devices: Blue
4. Isolated-Ground Receptacles: Orange

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 cable.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
1. Do not strip insulation from conductors until 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 nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:
1. Replace all devices that have been in temporary use during constructions 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 the conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to ¾ 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 that No. 12 AWG are installed on 15-A or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and

with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Section 16075.
   1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

END OF WIRING DEVICES

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16211

ELECTRICAL METERING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes equipment for utility company's electricity metering.

1.2 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish as follows:
   1. Comply with requirements of utilities providing electrical power and communication services.
   2. Coordinate installation and connection of utilities and services, including provision for electricity-metering components.

1.3 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 - Electrical

PART 2 - PRODUCTS

2.1 EQUIPMENT FOR ELECTRICITY METERING

A. Equipment for electrical metering by utility company

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install equipment for utility company metering. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install modular meter center according to NECA 400 switchboard installation requirements.

END OF ELECTRICAL METERING

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16289

TRANSIENT VOLTAGE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This section describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.2 QUALITY ASSURANCE

A. All Surge Protective Devices (SPDs) shall be tested and ***listed*** to ***ANSI/UL 1449-2006 (UL 1449 3rd Edition***) and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). "Manufactured in accordance with UL 1449" is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

1.3 CODES AND STANDARDS

A. ANSI/IEEE Std C62.41.1™-2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits

B. ANSI/IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

C. ANSI/IEEE Std C62.45™ -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits

D. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)

E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1

F. National Fire Protection Association (NFPA) 70 (N.E.C.) – 2002 - Article 285

G. ANSI/UL Standards 1449-2006 Listed (UL 1449 Third Edition), UL 1283 Listed, CUL Listed & CE compliant "low-voltage directive."

H. IEEE Standard C62.72™ - 2007 – IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits

PART 2 - PRODUCTS

2.1 MANUFACTURER QUALIFICATIONS

A. All surge suppression devices shall be manufactured by an ISO 9001-2008 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.

B. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.

C. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters), in combination with or for the protection of the suppression elements are expressly prohibited and will be rejected.

D. All SPDs shall be manufactured by the same manufacturer.

E. The listing of a manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein. Subject to compliance with requirements, provide products by the following manufacturers and specific models listed below only:
   1. Surge Suppression Incorporated (Advantage Series (888-212-2728)
   2. Liebert Corporation (560xx16 & 560xx17 Series) / 614-888-0246
   3. Current Technology (SL3-150 Series) / 800-238-5000
      or Pre-approved manufacturers.

F. Pre-Approval submittals for products by manufacturers not listed above must be submitted not less than ten (10) business days prior to bid date to allow ample engineering time for review of submitted products. Products not submitted within this timeframe will not be reviewed.

G. Submit proper documentation showing detailed (line-by-line) compliance with this specification. Prior approvals not received by the deadline date defined above will not be considered.

H. Along with the line-by-line compliance from manufacturers not listed herein, pre-approval surge suppression submittals shall include all of the items listed in Section V, below.

I. Incomplete submittal packages will not be approved.

2.2 SUBMITTALS

A. Surge suppression submittals shall include, but shall not be limited to the following items:
   1. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc
   2. Dimensioned drawing of each suppressor type indicating mounting arrangement.
   3. Manufacturer's ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
   4. Manufacturer's UL 1283 listing classification page and listing number(s).
   5. Certified test data documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and

scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270 degree electrical phase angles**).**

6. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
7. Certificate of declaration that product is CE low voltage directive compliant.
8. Statement of manufacturer's warranty duration and replacement policy.

2.3 REQUIREMENTS

A. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.

B. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc).

C. SPDs shall be Type 2 SPDs; Type 4 SPDs are not permitted. (Definitions: Type 1 SPD – Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device. Type 2 SPD – Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device; including SPDs located at the branch panel. Type 4 SPD – Recognized Component SPDs, including discrete components as well as component assemblies, which bear specific conditions of acceptability.)

D. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the Short Circuit Current Rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.

E. Permanently connected devices mounted parallel to the service, distribution, and sub panels are required. SPD device drawings shall be made available upon request.

F. The SPD shall have a Nominal Discharge Current (I_n) of 10 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006.))

G. Fusing:
   1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV. SPDs without thermal fuses or disconnects, or SPDs with shared thermal devices that disconnect more than one MOV are not acceptable.
   2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated 'silver-fuse-wire' (or other).

3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is expressly prohibited and will be rejected. Large-Block 34mm (50kA) square Thermal Protected MOVs are expressly prohibited and will not be accepted.
4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).

H. MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.

I. Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar" short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

J. Per Phase Ratings: 'Per-Phase' ratings for a three-phase Wye-connected SPD are determined by multiplying the kA per mode times the number of discrete modes of protection (directly connected suppression components), minus the value for the Neutral to Ground mode, divided by the number of phases. Per-Phase = (((kA per mode) X (# of modes))-(N-G mode kA)) / (# of phases)

K. Protection Modes:The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated, independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable and are not to be submitted. For 6 mode delta systems, 6 dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G). When a mode of protection is specified, the protective mode *must* be specifically included. Thus, Line-to-Neutral-to-Line is *not acceptable* where Line-to-Line is specified.

L. Sinewave Tracking Capability (a.k.a. Frequency Responsive Circuitry): Power panels and MCCs serving sensitive electronic equipment shall utilize voltage independent, dedicated Sinewave Tracking circuitry intended to mitigate the effects of switching or ringing surges that is specifically designed so that it can survive the surge environment. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking! The performance of sinewave tracking circuitry is defined by the level to which it mitigates Ring Wave transients and can be demonstrated in the test results of IEEE C62.41.2-2002, Category A Ring Wave (2kV). To demonstrate the sinewave tracking capability of the submitted devices, manufacturers shall submit 3rd party, independent tests results for units claiming sinewave tracking capability. Such tests shall include testing under the standards of ANSI/IEEE C62.41 and C62.45 category A (2kV, 67A, 100kHz ring wave) applied at the 270 degree phase angle, positive polarity, on a 120/208Vrms, 3 phase Wye device, on each of the following modes: line-to-neutral, line-to-ground, and line-to-line (dynamic tests with normal voltage applied to the unit under test), and neutral-to-ground (static test with no normal voltage applied to unit under test). The "let-through voltage" derived from each of these tests shall have a maximum amplitude of *less than* 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient.

Measurement of the let-through voltage shall be made with six-inches of lead length external to the SPD housing in accordance with ANSI/UL 1449-2006. Performance requirements are as stated in the table in Section VIII below (ANSI/IEEE C62.41 Let-Through Voltage) at Test Category A1.

M. STATUS INDICATORS: SPD UNITS SHALL HAVE PANEL FRONT STATUS MONITORS AS A MINIMUM TO INDICATE A CONTINUOUS POSITIVE STATUS OF EACH PROTECTED PHASE. A REMOTE AUDIBLE ALARM OPTION MUST BE SUPPLIED WHERE THE SPECIFYING ENGINEER DEEMS IT NECESSARY AND COST EFFECTIVE UNDER THE CIRCUMSTANCES. REFER TO THE APPROPRIATE DRAWINGS AND SCHEDULES FOR THESE DETAILS.

N. Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2008 certified company normally engaged in the design, development, and manufacture of such equipment.

O. Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with "load carrying" components are expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

P. Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.

Q. Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.

R. Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

S. All SPDs shall meet or exceed the following performance criteria:
1. Service Entrance (Category C): Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the Section VII, below.
2. Building Distribution Panels (Category B): The SPD shall provide a minimum protection of 180 kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.
3. Branch Panels/Panelboards *(Non-Electronics)* (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.
4. Branch Panels/Panelboards *(Electronics)* (Category A): The SPD shall provide a minimum protection of 120kA per phase, be of frequency responsive design, and be capable of meeting the Category A Let-Through Voltage criteria as shown in the Section VII, below.

5. Per Phase Ratings: 'Per-Phase' ratings for a three-phase Wye-connected SPD are determined by multiplying the kA per mode times the number of discrete modes of protection (directly connected suppression components), minus the value for the Neutral to Ground mode, divided by the number of phases.Per-Phase = (((kA per mode) X (# of modes))-(N-G mode kA)) / (# of phases)

2.4 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

A. The SPD shall meet the Let-Through Voltage requirements shown in the tables below for voltage and locations specified. All voltages shall be peak (±10%), Positive Polarity, Time base = 10µS, Sampling Rate = 500 Megasamples per second to ensure maximum transient capture. [These settings assure Let-through Voltage test results are accurate]. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (unpowered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:

1. Service Entrance ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree phase angle, shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	120/208Y	277/480Y	480V, 3ØΔ
L-N	1075V	1340V	N/A
L-L	1390V	1990V	1990V
L-G	1060V	1310V	2150V
N-G	1450V	1730V	N/A

2. Distribution and Branch Panels/Panelboards (Non-Electronics) ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	120/208Y	277/480Y	480V, 3ØΔ
L-N	395V	520V	N/A
L-L	570V	790V	900V
L-G	375V	500V	900V
N-G	590V	1010V	N/A

3. Branch Panels/Panelboards *(Electronics)* ANSI/IEEE Cat. A Ring Wave Let-through-Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Ring Wave (2kV, 67 amps, 100kHz ring wave) at the 270 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sinewave to the peak of the transient):

Mode / Voltage	120/208Y	277/480Y	480V, 3ØΔ
L-N	30V	65V	N/A
L-L	60V	65V	80V
L-G	50V	85V	80V
N-G	50V	65V	N/A

2.5 ANSI/UL 1449-2006 VOLTAGE PROTECTIVE RATING

A. Voltage Protection Rating (VPR) is a rating selected from a list of preferred values as detailed in ANSI/UL 1449-2006 and assigned to each mode of protection. The value of VPR is determined as the nearest highest value taken from a list of preferred values (as detailed in ANSI/UL 1449-2006) compared to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

B. The SPD shall have Voltage Protection Ratings (VPRs) no greater than those shown below:

Nominal System Voltage	Mode	VPR
Single-Phase 120/240	L-N L-G N-G L-L	600 V 600 V 700 V 1000 V
Three-Phase 120/240 Delta	L-N HL-N L-G HL-G N-G L-L HL-L	600 V 1200 V 600 V 1200 V 700 V 1000 V 1000 V
120/208 Wye	L-N L-G N-G L-L	600 V 600 V 700 V 1000 V
277/480 Wye	L-N L-G N-G L-L	1200 V 1200 V 1200 V 1800 V
480 No Neutral (Delta)	L-G L-L	1800 V 1800 V

2.6 WARRANTY

A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of twenty-five (25) years from date of substantial completion.

B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner.

Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.

C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.

B. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.

C. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

D. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.

E. If any lead lengths exceed 18", the Contractor responsible for installation ***must*** contact the specifying electrical engineer and the surge suppression manufacturer or distributor (888-212-2728) for installation assistance.

F. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

G. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.

H. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.

I. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation

END OF TRANSIENT VOLTAGE SUPPRESSION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16410

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Molded-case circuit breakers.
   4. Enclosures.

1.2 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Spares: For the following:
      a. Potential Transformer Fuses: 1 set for each ampere rating used for the project.
      b. Control-Power Fuses: 1 set for each ampere rating used for the project.
      c. Fuses and Fusible Devices for Fused Circuit Breakers: 1 set for each ampere rating used for the project.
      d. Fuses for Fusible Switches: 1 set for each ampere rating used for the project.
      e. Fuses for Fused Power Circuit Devices: 1 set for each ampere rating used for the project.
   2. Spare Indicating Lights: Six of each type installed.

1.3 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 - Electrical

1.4 SUBMITTALS

A. Product Data: Submit data in accordance with Section 01330 and Section 16000.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Square D/Group Schneider
   2. Siemens Energy & Automation, Inc.
   3. Eaton Corporation; Cutler-Hammer Products.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD heavy duty, 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. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD heavy duty, 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.

2.2 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:
   1. Square D/Group Schneider.
   2. Siemens Energy & Automation, Inc.
   3. Eaton Corporation; Cutler-Hammer Products.

B. Molded-Case Circuit-Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents as indicated on plans.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic Trip-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 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 Features and Accessories: Features and Accessories shall apply when noted on plans
   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
   4. Ground-Fault Protection: relay and trip unit with adjustable pickup and time delay settings, push-to-test feature, and ground-fault indicator.
   5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
   6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

7. 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.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Listing: The circuit breaker ampere rating shall be readily legible (without removing interior cover) on switch handle facing away from the breaker. Legible text shall be high contrast in relation to breaker molding, example if breaker molding is black, use legible white text.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1, Type HS to meet environmental conditions of installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
2. Corrosive Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 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 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 – Electrical

1.3 SUBMITTALS

A. Submit product data in accordance with Section 01330 and Section 16000.

1.4 QUALITY ASSURANCE

A. Comply with NEMA PB 1.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and framework requirements as specified on plans.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Panelboards, Over-current Protective Devices, Controllers, Contactors, and Accessories:
      a. Eaton Corp.; Cutler-Hammer Products.
      b. Siemens Energy & Automation, Inc.
      c. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, as indicated on plans.
   1. Rated for environmental conditions at installed location.
      a. Outdoor locations: NEMA 250, Type 3R or 4x SS as indicated.
      b. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
   2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
   4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall and ceiling or floor.
   5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
   6. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.
   7. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
   8. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.
   2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
   3. Isolated Equipment Ground Bus (where indicated on schedules): Adequate for branch circuit equipment ground conductors; insulated from box.
   4. Extra-Capacity Neutral Bus (where indicated on schedules): Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
   5. Split Bus (where indicated on schedules): Vertical buses divided into individual vertical sections.

C. Conductor Connectors: Suitable for use with conductor material.
   1. Main and Neutral Lugs: Mechanical type.
   2. Ground Lugs and Bus Configured Terminators: Compression type.
   3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

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 installations of devices.

2.3 PANELBOARD SHORT-CIRCUIT RAITING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals. Series rating is not acceptable.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

B. Main Over-current Protective Devices: Circuit Breaker or Fused switch as indicated on plans.

C. Branch over-current protective devices shall be one of the following:

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.
3. Fused switches.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers are specified in Section 16410 “Enclosed Switches and Circuit Breakers”.

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 over-current protective devices and controllers.
   1. Set field adjustable switches and circuit breaker trip ranges.

E. Install filler plates in unused protective device spaces.

F. Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification".

B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

Example:

PANEL A
PHASE A – BROWN
PHASE B – ORANGE
PHASE C – YELLOW
NEUTRAL – GRAY
GROUND - GREEN

3.3 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF PANELBOARDS

SECTION 16491

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fuses rated 600 V and less.
   1. Cartridge fuses rated 600 V and less for use in switches, panelboards, switchboards, controllers, and motor-control centers.
   2. Spare-fuse cabinets.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 – Electrical

1.3 SUBMITTAL

A. Submit product data in accordance with Section 01330 and Section 16000.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from one source by a single manufacturer.

B. Comply with NEMA FU 1.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Quantity equal to 10 percent of each fuse type and size, but no fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products.

B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

1. Cooper Bussmann, 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.

2.3 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch 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 high letters on exterior of door.
   4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Service Entrance: Class L time delay (601A-6000A); RK1 time Delay (0-600A).

B. Feeders: Class L time delay (601A-6000A); RK1 time delay (0-600A).

C. Motor Branch Circuits: Class RK1 time delay.

D. Other Branch Circuits: Class RK1 time delay.

3.2 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse. Verify indicated fuse sizes with equipment nameplate and installation instructions.

B. Install spare-fuse cabinet(s).

C. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF FUSES

SECTION 16512

LED LIGHTING

PART 1 – GENERAL

1.1 REQUIREMENTS

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 SCOPE

A. The work covered under this Section shall include furnishing and installing light emitting diode (L.E.D.) luminaires (lighting fixtures) complete as shown on the Drawings, as described in the “Luminaire (Lighting Fixture) Schedule", and as herein specified.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 QUALITY ASSURANCE

A. This contractor shall provide luminaires that are of a manufacturer engaged in the production of luminaires that are equal in material, design and workmanship. The manufacturer’s luminaire shall have been in satisfactory commercial or industrial use for a minimum of three (3) years. The manufacturer’s luminaire shall have been available on the commercial market during the three (3) year period.

B. L.E.D. luminaires shall conform to the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.

C. The luminaires shall be listed by Underwriters Laboratories, Inc. (UL) or listed by a nationally recognized testing laboratory acceptable to Fairfax County DPWES.

D. Submittals are required in accordance with SECTION 16000 of these Specifications.

1.5 ACTION SUBMITTALS

H. Product Data: For each type of product.
1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.
   a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
   b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

I. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

J. Sustainable Design Submittals:

K. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

L. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
1. Include Samples of luminaires and accessories involving color and finish selection.

M. Samples for Verification: For each type of luminaire.
1. Include Samples of luminaires and accessories to verify finish selection.

N. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

O. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment and or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:
   a. Other luminaires.

b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Ceiling-mounted projectors.

7. Moldings.

P. Qualification Data: For testing laboratory providing photometric data for luminaires.

Q. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

R. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

S. Product Certificates: For each type of luminaire.

T. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

U. Sample warranty.

1.7 CLOSEOUT SUBMITTALS

V. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.8 MAINTENANCE MATERIAL SUBMITTALS

W. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.9 DESCRIPTION

A. This Contractor shall furnish, assemble, and install L.E.D. luminaires complete with sockets, louvers, lenses, internal wiring, leads, trims, rings, frames, hangers, straps, reflectors, light engine, and power supply unit (driver) as applicable and required for a complete installation.

B. Luminaires that require remote mounting of any components needed for its operation, such as drivers, or light engine electronics are not permitted. All

components needed to make the luminaire operational shall be integral to the luminaire housing.

1.10 DELIVERY, STORAGE, AND HANDLING

X. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.11 WARRANTY

A. This Contractor shall deliver the work described herein in a first class operating condition in every respect. This Contractor shall also warrant that the material and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractors own expense. Refer to SECTION 01740 for the start of the warranty period. The contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

1. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

2. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

B. In Interior Lighting Fixture Schedule where tiles below are column or row headings that introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Substitutions of any light fixture to a type or manufacturer other than that specified shall be subject to review by the engineer. To facilitate this review the contractor shall provide with his submittal a lighting fixture schedule, similar to the one provided within the plan set, listing number of lamps, voltage, manufacturer, and model number. The proposed substitution shall be provided with I.T.L. photometrics dated no older than five-years and line item pricing for each substitute fixture. The engineer reserves the right to request a full-scale mock-up of two (2) proposed substitution fixtures alongside two (2) specified fixtures for review. All mock-up costs, including Engineer's time and expenses, shall be at the expense of the submitting contractor and/or manufacturer.

2. The submitting Contractor/Manufacturer shall guarantee in writing that the proposed substitute fixture shall meet all performance and quality parameters as stated with the specified fixture. In the event that the substitute fixture fails to perform as guaranteed, all costs associated to remove the fixture and replace them with the specified fixture shall be at the Contractor/Manufacturer expense.

2.2 MATERIALS AND COMPONENTS

A. The L.E.D. luminaires supplied shall have the proper trim, frames, mounting devices, configuration, and accessories necessary to be properly installed in the building construction. Catalog numbers of luminaires in the “Luminaire Schedule” or "Lighting Fixture Schedule" on the Drawings are to establish a type of luminaire and not to determine a method of mounting.

1. Catalog numbers scheduled on the Drawings may indicate luminaire compatibility with certain types of ceiling construction. The Contractor shall determine exact type of ceilings actually to be furnished in each area and shall obtain luminaires to suit, deviating from specified catalog numbers or descriptions only where necessary, and only to the extent necessary to insure luminaire-ceiling compatibility. The Contractor shall notify the Architect/Engineer and Owner in writing where such changes are to be made.

B. Where L.E.D. luminaires are specified on the Drawings to be complete with a flat diffusing lens, the lens shall be virgin acrylic Type 19 pattern with a minimum thickness of 0.156 inches unless otherwise shown on the Drawings.

C. When L.E.D. luminaires are specified on the Drawings to be complete with a curved or rounded lens refractor/diffuser, the lens shall be impact resistant 100% virgin acrylic type with diffusing optical film.

D. Double lock nuts shall be used at the load bearing ends of threaded pipe used as part of a stem mounting assembly.

2.3 POWER SUPPLY UNIT (DRIVERS)

A. Luminaires shall be equipped with an L.E.D. driver(s) that accepts the voltage as indicated on the "Luminaire (Lighting Fixture) Schedule". Individual driver(s) shall be replaceable.

B. Driver(s) shall be UL8750 class 2 compliant for their intended purpose.
C. Total harmonic distortion (THD) for current: ≤ 20%
D. Driver(s) shall be rated to operate between -30ºC to 50ºC minimum.
E. Individual driver(s) shall be equipped with surge protection (2kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.

F. Driver(s) shall have a minimum efficiency of 85%.
G. Drivers shall deliver dimming to 1% light output from 0-10V control signal.

2.4 L.E.D. LIGHT SOURCE (LIGHT ENGINE)

A. Individual light engine(s) shall be replaceable.

B. L.E.D. light engine(s) shall have a minimum lifetime of 50,000+ hours at 40º C

and shall have a minimum efficiency of 80 lumens per watt.

C L.E.D. dies shall be tested in accordance with I.E.S.N.A. LM-80-08 standards.

D. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

2.5 SPARE PARTS

A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. driver assemblies. LED drivers shall be turned over to the Owner representative in their manufacturer's protective packaging. LED drivers not in their protective packaging will not be acceptable.

B. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. light engine assemblies. LED light engines shall be turned over to the Owner representative in their manufacturer's protective packaging. L.E.D. light engines not in their protective packaging will not be acceptable.

2.6 EMERGENCY LED POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Operate LED fixture continuously at an output of 1100 lumens. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture.

2. Night Light Connection: Operate LED fixture continuously.

3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

b. Indicator Light: LED indicates normal power on. Normal glow indicates "Trickle Charge"; bright glow indicates "Charging at End of Discharge Cycle".

4. Battery: Sealed, maintenance-free, nickel-cadmium type.

5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

6. Remote Test: Switch in hand-held remote device aimed in direction of tested unit indicates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit

triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

2.7 EXIT LIGHTS

A. Exit lights (signs) shall be universal mount and complete with factory installed light-emitting diodes (L.E.D.'s) mounted behind a red diffusing panel and with direction arrows as shown on the Drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. L.E.D. luminaires (lighting fixtures) shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations.

B. Wall washer type L.E.D. luminaires for illumination of white (marker) boards shall be located at a distance away from the wall and at a mounting height (pendant type fixtures) to achieve the best illumination for the marker board. This Contractor shall refer to the luminaire manufacturer's published product literature to determine the optimum distances from the wall and mounting height. Various ceiling heights may vary the distances. Pendant type L.E.D. luminaires shall be mounted no lower than 80 inches above finished floor per ADA.

C. Recessed lay-in type linear L.E.D. luminaires shall be supported from the building structure independently of the ceiling grids with a minimum of four (4) steel tie wires per luminaire or as detailed on the Drawings.

D. Recessed lay-in type linear L.E.D. luminaires installed in lay-in type ceiling tile shall be securely fastened from the building structure and be installed in the layin type ceiling in such a manner that the louver/lens housing may be easily opened and so that the luminaires may be removed and relocated without forcing the luminaires or changing the grid system tie wires. This Contractor shall coordinate with the ceiling installer before the ceiling grid is installed to assure a mutually satisfactory installation of ceiling and luminaires.

E. Recessed L.E.D. luminaires installed in "hard" ceiling systems (i.e. drywall, metal pan, etc.) shall be securely fastened from the building structure and be installed in such a manner that the louver/lens housing may be easily opened and so that the luminaires may be removed and relocated without forcing the luminaires or changing the ceiling support system. This Contractor shall coordinate with the ceiling installer before the ceiling is installed to assure a mutually satisfactory installation of ceiling and luminaires.

F. Surface mounted linear L.E.D. luminaires shall be supported from the building structure with a minimum of two (2) 1/4 inch threaded rods per each one (1) foot wide by four (4) foot long and a minimum of four (4) 1/4 inch threaded rods per each two (2) foot wide by four (4) foot long luminaire as detailed on the Drawings.

G. Pendant/suspended luminaires shall be supported from the building structure with 1/4 inch threaded rods at each of the luminaires suspension points. Hardware connections to the threaded rods shall be listed components from the luminaire manufacturer and be specifically designed for the type of suspension called for on the Drawings. Installation shall be in accordance with the manufacturer's instructions.

H. Recessed non-linear L.E.D. luminaires (i.e. downlights) located in lay-in type ceiling tile shall be mounted in the center of the tile or as shown on the Drawings and shall be supported by means of bar hangers extended across the main ceiling support members and also supported from the building structure with no less than one (1) 1/4 inch threaded rod per luminaire. Where luminaires are installed in slopped ceilings the luminaires shall be complete with appropriate slopped ceiling adapters.

I. Surface mounted non-linear L.E.D. luminaires and exit lights shall be supported from the building structure with a minimum of two (2) 1/4 inch threaded rods per luminaire or exit light.

J. 1-1/2 inch x 1-1/2 inch steel framing channel shall be used where required to span bar joists and otherwise facilitate structural support for luminaires and exit lights.

K. Ceiling grid layouts when indicated on the electrical Drawings are for convenience only. This Contractor shall coordinate the luminaires layout with the Architect/Engineer and all other trades before the ceiling grid, air outlets, and luminaires are installed.

L. L.E.D. luminaires installed in mechanical room and other similar equipment rooms shall be located in the field to clear all obstructions such as ducts, piping, bracing, and supports. Where the location of luminaires shown on the Drawings must be radically changed, approval from the Architect/Engineer shall be obtained before the luminaire is placed.

M. Pendant mounted luminaires and exit lights shall be located to avoid mechanical systems, ductwork, piping, structural members, and the like.

N. Supports shall not terminate or be fastened directly to the roof decking.

3.2 GENERAL CONFORMANCE

A. Surface mounted luminaires shall not have gaps between the luminaire and attaching surface, except where required by code regulations or manufacturer's instructions.

B. Recessed luminaires shall not have gaps between the luminaire trim and the adjacent surface. Where light leaks occur, suitable gaskets shall be furnished and installed.

C. Install luminaires level, plumb and true. Align rows accurately in three (3) dimensions.

D. Where luminaires are to be installed in areas without ceilings, this Contractor shall furnish supports consisting of threaded rods and steel channels as required to have a finished mounting height of 8'-0" to bottom of the luminaire (or other mounting height as shown on the Drawings), unless pendant or chain mounting is indicated on the Drawings or Luminaire Schedule.

E. Recessed luminaires shall be connected with flexible metal conduit or MC Cable (maximum 6'-0" length) from outlet boxes mounted above or alongside of luminaire. Luminaires shall be wired in such a way that removal of one shall not disrupt the continuity of power to the others.

F. All luminaires designated for wet locations shall have sealed conduit entries. Any luminaire leaking water before or during the warranty period shall be repaired or replaced by this Contractor at no additional expense to the Owner.

G. Prior to final inspection, this Contractor shall check all L.E.D. luminaires for damages during construction and replace the damaged luminaires where necessary at no additional expense to the Owner. All luminaires shall be cleaned at the time of final acceptance of the building.

END OF LED LIGHTING

SECTION 16601

THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 16000 - Electrical

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01330 and Section 01782:
   1. Product Data: Including (but not limited to) process design, equipment information, installation requirements.
   2. Shop Drawings: Including (but not limited to) equipment layout, electrical wiring diagrams, anchor bolt placements.

B. Operations and Maintenance Data: In accordance with Section 01782.

1.4 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are UL Listed, produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
   1. Fire-resistance-rated walls including firewalls, fire partitions, fire barriers, and smoke barriers.
   2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and Ceiling membranes of roof/ceiling assemblies.
   3. Fire stopping method shall comply with UL “Fire Resistance Directory” requirements for rated assembly in which it is to be installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
   1. Hilti, Inc.
   2. RectorSeal Corporation (The).

3. 3M; Fire Protection Products Division.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATIOIN FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

3.2 IDENTIFY THROUGH-PENETRATIOIN FIRESTOP SYSTEM

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
   1. The words "Warning – Through-Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name.

END OF THROUGH-PENETRATED FIRESTOP SYSTEMS

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 16710

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 PURPOSE

A. This document defines the products and the execution requirements required to furnish and install a complete distribution system utilizing a structured cabling system.

B. All cables and related terminations, support and grounding hardware shall be furnished, installed, tested, and documented by the structured cabling contractor as detailed in this document.

C. The distribution system shall be all inclusive and represent a complete installation at the sites shown on the attached drawings and in the attached specifications. The structured cabling contractor shall be responsible for all parts, labor, and all other associated apparatus necessary to completely install, test and turnover for acceptance to the Customer the cabling system detailed herein.

D. Product specifications and general design considerations are provided in this document. Quantities of telecommunication outlets, typical installation details, cable routing and outlet types will be provided in the contract drawings. The successful structured cabling contractor shall meet or exceed all requirements for the cable system described in this document and as indicated in the contract drawings.

E. Refer to contract drawings for additional requirements to include color coding of faceplates, jacks and cables, labeling, installation, etc.

1.2 RELATED REQUIREMENTS

A. Drawings and general provision of Contract, including General and Supplementary Conditions, Division-1 Specification, and Division 16 Electrical sections apply to work in this section.

1.3 REFERENCE STANDARDS

A. Note use the latest ratified codes and standards for the following:

B. ANSI/TIA/EIA-568 Commercial Building Telecommunications Cabling Standard.

C. ANSI/TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.

D. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

E. ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

F. ANSI/TIA/EIA-526 Measurement of Optical Power.

G. ANSI/TIA/EIA-758 Customer-Owned Outside Plant Telecommunications Cabling Standard.
   1. Install cabling in accordance with the most recent edition of BICSI publications. BICSI-Telecommunications Distribution Methods Manual.
   2. BICSI-Installation Transport Systems information Manual.
   3. BICSI-Network Design Reference Design Manual.

4. BICSI-Outside Plant Design Reference Manual.

H. Federal, State and local codes, rules, regulations, and ordinances governing the work, are fully part of the specifications as if herein repeated or hereto attached.

I. If the contractor should note items in the drawings or the specifications, construction of which would be a code violation(s), promptly call them to the attention of the owner's representative in writing.

J. All material shall be listed by UL or other national independent testing standard shall apply.

K. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The structured cabling contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

L. This document does not replace any code, either partially or wholly. The structured cabling contractor must be aware of local codes that may impact this project.

M. MER- Main Equipment Room

N. TER- Telecommunication Equipment Room

1.4 APPROVED CONTRACTOR

A. The structured cabling contractor is responsible for workmanship and installation practices in accordance with the manufacturer's written policies.

B. The cable and connectivity manufacturer will extend a manufacturer's warranty for all products installed in this project to the end user once the structured cabling contractor fulfills all requirements under these specifications.

C. The structured cabling contractor must provide a reference list with contact names and phone numbers for three (3) projects of similar scope.

D. **Structured cabling contractor must be a certified contractor with a connectivity manufacturer specified in this document and be in good standing with manufacturer's 25-year warranty program. A copy of the manufacturer's certification documents must be submitted with the product submittals in order for such quote to be valid.**

E. Structured cabling contractor must have a current Registered Communications Distribution Designer (RCDD) on staff and be responsible for this project. **RCDD credentials shall be submitted with bid.**

F. The owner reserves the right to require the structured cabling contractor to remove from the project any such employee the owner deems to be incompetent, careless or insubordinate.

G. All clean up activity related to work performed will be the responsibility of the structured cabling contractor and must be completed daily before leaving the site.

1.5 SUBMITTALS

A. See Section 16000 - Electrical, for submittal procedures.

B. Submit to the engineer/designer shop drawings, product data (including cut sheets and catalog information), and samples required by the contract documents. Submit shop drawings, product data, country of origin and samples with such promptness and in such sequence as to cause no delay in the work or in the activities of other contractors. The engineer/designer will indicate approval of shop drawings, product data, and samples submitted to the engineer by stamping submittals "APPROVED" with a stamp. Submitted shop drawings shall be initialed or signed by the structured cabling contractor's legitimate firm name.

1. By submitting shop drawings, product data, and samples, the structured cabling contractor acknowledges that he/she carefully reviewed and verified materials, quantities, field measurements, and field construction criteria related thereto. It also demonstrates that the structured cabling contractor has checked, coordinated, and verified that information contained within shop drawings, product data, and samples conform to the requirements of the work and of the contract documents. The engineer/designer remains responsible for the design concept expressed in the contract documents as defined herein.
2. The engineer's/designer's approval of shop drawings, product data, and samples submitted by the structured cabling contractor shall not relieve the structured cabling contractor of responsibility for deviations from requirements of the contract documents, unless the structured cabling contractor has specifically informed the engineer/designer in writing of such deviation at time of submittal, and the engineer/designer has given written approval of the specific deviation. The structured cabling contractor shall continue to be responsible for deviations from requirements of the contract documents not specifically noted by the structured cabling contractor in writing, and specifically approved by the engineer in writing.
3. The engineer's/designer's approval of shop drawings, product data, and samples shall not relieve the structured cabling contractor of responsibility for errors or omissions in such shop drawings, product data, and samples.
4. Storage and handling requirements and recommendations.
5. Installation method.

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 RCDD.

D. Submit proof from manufacturer's good standing in manufactures warranty program.

E. Submit letter from manufacturer stating that the manufacturer will provide 25-year performance warranty that covers labor, material and applications.

F. Submit copy of structured cabling contractor's RCDD certification.

G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least ten (10) days prior to intended test date.

H. Upon request by the engineer/designer, furnish a list of references with specific information regarding type of project and involvement in providing of equipment and systems.

I. Submit references as required.

J. At completion of project, structured cabling contractor shall submit the following:
   1. Copper certification test results, computer generated hard copy and diskettes.
   2. Optical fiber power meter/light source certification test results in computer generated hard copy and in diskettes.
   3. Project Record Documents: Prepared and approved by RCDD.
      a.) Submit scale drawings for each 1/2" = 1'0"- drawing for each MER and each TR showing all racks, patch panels, 110 blocks etc.
      b.) Identify distribution frames and equipment rooms by room number on contract drawings.
      c.) Copper certification test results printouts and diskettes.
      d.) Optical fiber power meter/light source test results.
      e.) Labeling and administration documentation.
      f.) Manufacturer's 25-year warranty certificate.

K. Work shall not proceed without the engineer's approval of the submitted items.

L. The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

1.6 QUALITY ASSURANCE

A. The structured cabling contractor shall be fully capable and experienced in the structured cabling system specified. The contractor shall have at least 3 years' experience in structured cabling.

B. The structured cabling contractor shall employ a project manager who is a RCDD.

C. Equipment and materials of the type for which are independent standard testing requirements, listings, and labels, shall be listed and labeled by the Independent testing laboratory.

D. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout installation.

E. Product Requirements:
   1. Product shall be manufactured by an ISO 9001-2000 Certified Facility.
   2. Product shall be free from defects in material and workmanship.
   3. Manufacturer must have a field representative who is industry qualified to provide quality control inspections during the life of the project.

1.7 DELIVERY, STORAGE, AND HANDLING

A . Products must be stored according manufacturer's recommendations as a minimum.

B . Keep stored products clean and dry.

C . If the structured cabling contractor wishes to have a trailer on site for storage of materials,

arrangements shall be made with the owner.

1.8 DRAWINGS

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowance in bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the structured cabling contractor shall call to the attention of the engineer in writing any materials or apparatus the structured cabling contractor believes to be inadequate and to any necessary items of work omitted.

1.9 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. The structured cabling contractor shall provide a manufacturer's warranty to guarantee end-to-end high performance cabling systems that meet application requirements. The guarantee shall include horizontal and backbone cable and connectivity components, and have one point of contact for all cabling system issues. The system shall be warranted for a period of at least **25 years** and shell meet or exceed the EIA/TIA standards as specified.

C. Materials and workmanship hereinafter specified shall be fully guaranteed by the structured cabling contractor for a one (1) year period after date of substantial completion against any defects. Defects which may occur as the result of faulty materials or workmanship within one year after installation and acceptance by the customer shall be corrected by the structured cabling contractor at no additional cost to the customer. The structured cabling contractor shall promptly, at no cost to the customer, correct re-perform (including modifications or additions as necessary) any nonconforming or defective work within one (1) year after completion of the project of which the work is part.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS

A. Due to the nature and type of communications, all products, including but not limited to racks, patch panels, jacks, faceplates, patch cords, shall be manufactured by Panduit, Hubbell or Hellermann Tyton**.**

B. All copper and optical fiber cable shall be manufactured by Hitachi Cable Manchester (HCM), General Cable, Panduit, Hubbell or Southwire.

C. Provide products of manufacturers as named in individual articles.

D. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.

E. The request for substitutions must be received fourteen (14) days prior to bid opening by engineer in writing, listing any and all physical and technical differences between product specified and product request for substitution. Product samples of each item must accompany written request.

F. Accepted substitutions will only be approved by means of addendum.

2.2 WORK AREA OUTLETS

A. Work area outlets shall each be terminated at their designated work area location in the connector types described below.

B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the structured cabling contractor shall submit the proposed configuration for each outlet assembly, with labeling, for review by owner.

C. The wiring scheme for this project shall be T568B unless otherwise directed by customer.

D. Modular Jack:
1. Shall meet or exceed Category 6 EIA/TIA standard.
2. Where color is not indicated coordinate with engineer prior to installation.
3. Approved Product:
   a.) Hubbell #HUBHXJ6XX Color as indicated on contract drawings
   b.) Panduit #PANCJ688TG** Color as indicated on contract drawings.
   c.) Hellermann Tyton #TYTRJ45FC6-XXX Color as indicated on contract drawings.

E. Modular Jack for Wireless Access Point:
1. Contractor shall install a minimum of two (2) Category 6 Green cables and a minimum of two (2) Category 6 Green jacks for each wireless access point location.
2. Approved Product:
   a.) Hubbell #HUBHXJ6GN Green in color as indicated on contract drawings
   b.) Panduit #PANCJ688TGGN
   c.) Hellermann Tyton #TYTRJ45FC6-GRN

F. Category 6 UTP Patch Cords:
1. Category 6 patch cords shall be factory terminated with modular plugs featuring a tangle-free latch design and clear strain-relief boots to support easy moves, adds and changes (MACs). Each patch cord shall be 100% performance tested at the factory to the TIA/EIA Category 6 standard.
2. **Patch cord shall be included in manufacturer's 25-year warranty**.
3. Structured cabling contractor shall provide to customer at end of project:
   a.) One (1) patch cord for each data cable installed in each MER/TER. Patch cord length shall be capable of being installed from patch panel to customer equipment.
   b.) One (1) 15ft patch cord for each data cable installed in work area.
   c.) One (1) Patch cord for each voice cable installed in each MER/TER. Patch cord length shall be capable of being installed from patch panel to customer equipment.

d.) One (1) 25ft patch cord for each wireless access point cable in work area.
e.) One (1) patch cord for each wireless access point cable installed in each MER/TER. Patch cord length shall be capable of being installed from patch panel to customer equipment.
f.) Patch cord color shall match the color of jack and cable.
g.) Approved Product:
    1) Hubbell
    2) Panduit
    3) Hellermann Tyton

2.3 FIBER OPTIC PATCH CORDS

A. Structured cabling contractor shall provide two (2) LC to SC 3-meter duplex multimode OM3 fiber optic patch cords for each TER.
    1. Approved Product:
        a.) Hubbell
        b.) Panduit
        c.) Hellermann Tyton #TYTFA3LCSC10G

2.4 HORIZONTAL PATCH PANELS

A. The voice and data cables shall be installed in separate patch panels and in separate racks or as indicated on plans.

B. All patch panels shall be 48-port modular design.

C. All voice patch panels shall be 48-port modular.

D. All data patch panels shall be 48-port modular design.

E. All wireless access panels shall be 48-port modular design.

F. Fully populate all ports with Category 6 jacks to match the color of the work area outlets.

G. The mixing of colors will not be allowed.
    1. Approved Product:
        a.) Hubbell #HUBUDX48E
        b.) Panduit #PANCPPL48WBLY
        c.) Hellermann Tyton #TYTPP110C6-48

2.5 FACEPLATES

A. Approved Product:
    1. Hubbell #HUBSSFLxx (stainless steel; match electrical. Number of ports as required)
    2. Panduit
    3. Hellermann Tyton #TYTFPDUAL-SS

2.6 LIGHTNING PROTECTION

A. Structured cabling contractor shall provide lightning protection for any copper communication cable installed under this contract that enters or leaves a building.
   1. Approved Product:
      a.) Circa.
      b.) Pre-approved equal.

2.7 FIBER PATCH PANEL

A. Shall mount in standard 19" EIA rack or cabinet. Shall have front and rear access on all modules via molded-hinged doors. Must have radius control and cable management for fiber patch cords. Shall have multiple cable entry locations. Include fiber optic cable routing kit (grommets, cable ties, saddle clips, strain relief bracket and ID/caution labels for various cable management solutions.
   1. Approved Product:
      a.) Hubbell
      b.) Panduit
      c.) Hellermann Tyton

2.8 MULTIMODE FIBER ADAPTER PANELS OM3 50/125 um

A. All adapter panels shall use zirconia ceramic split sleeves. Use blank adapters in each empty port.

B. All ports shall be duplex LC.

C. All multimode fiber panel shall be OM3 aqua in color.
   1. Approved Product
      a.) Hubbell #HUBFSPLCDS3AQ (6-fiber)
      b.) Hubbell # HUBFSPLCDS6AQ (12-fiber)
      c.) Panduit
      d.) Hellermann Tyton #TYTFAP6DMMLC10G

2.9 SINGLEMODE FIBER ADAPTER PANELS

A. All adapter panels shall use zirconia split sleeves. Use blank adapters in each empty port. All singlemode panels shall be blue in color. All ports shall be LC.
   1. Approved Product:
      a.) Hubbell #HUBFSPLCDS3 (6-fiber)
      b.) Hubbell #HUBFSPLCDS6 (12-fIber)
      c.) Panduit
      d.) Hellermann Tyton #TYTFAP6DMMLC10G

2.10 FIBER OPTIC CONNECTORS

A. Multimode fiber optic connectors shall be LC-type; OM3 50/125.

B. Singlemode fiber optic connectors shall be LC-type.

C. Fiber Optic connectors must be included in the 25 year warranty and must be of same manufacture as connectivity.

1. Approved Product:
   a.) Hubbell #HUBFCLC900K50GM12 (multimode)
   b.) Hubbell #HUBFCLC900KSM12 (singlemode)
   c.) Panduit #PANFSCMCXAQ (multimode)
   d.) Panduit #PANFSCSCBU (singlemode)
   e.) Hellermann Tyton #TYTPFCSC10G

2.11 RACKS

A. Furnish and install a minimum of two UL listed 7ft free standing racks in each MER/TER (unless otherwise indicated on prints).

B. Secure racks to floor per manufacturer's instructions and install 18" equipment tray from top of each rack to wall.

C. Ground each rack per ANSI/TIA/EIA-607 requirements.

D. Maintain 36" clearance from the front and rear of rack and on one side.

E. Make allowances to maintain minimum of 30" of clearance from wall to back of rack mounted equipment (UPS, Switches, Hubs, etc..). Coordinate with Engineer prior to installation.

F. If more than one (1) rack is installed, install in a line side to side, with appropriate vertical cable management on each side and between racks.

G. Rack System:
   1. Waterfall cable management shall be provided at top of each rack for protection and to maintain proper bend radius and cable support.
   2. The rack shall be UL listed for 1000 lb. load rating. The rack shall be installed to support 19" equipment.
      a.) Approved Product:
         1) Hubbell #HUBHPW84RR19 (2-post)
         2) Hubbell #HUBH1F84 (4-post)
         3) Panduit
         4) Hellermann Tyton #TYTT7RRB
         5) B-Line

H. Wall-mount racks :
   1. Be as specified on plans.
   2. Install horizontal and vertical cable management to support cables.
      a.) Approved Product:
         1) Hubbell
         2) B-Line #BLNSB542096FB
         3) Panduit
         4) Hellermann Tyton #TYTWMB2BH

I. Single Sided Mounted Shelf
   1. Be as specified on plans
      a.) Approved Product

1) B-Line- #BLNSB5961919AFB
2) Pre-Approved Equal

J. Rack Mount Keyboard Tray
1. Be as specified on plans
a.) Approved Product
1) B-line #SB742T19FB
2) Pre-Approved Equal.

2.12 HORIZONTAL WIRE MANAGEMENT

A. Structured cabling contractor shall install horizontal front & rear management above, between and below each copper 48-port or (2) 24 port patch panel's. Horizontal wire management shall be capable of managing the maximum number of patch cords.
1. Approved Product:
a.) Hubbell #HUBHC219CE3N
b.) Panduit
c.) Hellermann Tyton #TYTWMB2BH

2.13 VERTICAL CABLE MANAGEMENT AND DOORS

A. Cable management shall be provided on each side and between each set of racks, using the vertical cable management system. Structured cabling contractor to confirm vertical cable management will support number of cables installed with 25% growth for future. Doors are required to be installed on all vertical managers.
1. Approved Product:
a.) Hubbell #HUBBS76H
b.) Hubbell #HUBXS0610
c.) Hubbell #HUBXS0615
d.) Hubbell #HUBVS73H (Install on back rails of 4-post racks; 10" Vertical manager front only)
e.) Panduit
f.) Hellermann Tyton #TYTVWMDS4X5BK7H

2.14 RACK-MOUNT POWER STRIP

D. Structured cabling contractor shall install one (1) UL listed rack-mount 20 amp power strip with circuit breaker in each floor mount or wall mount rack.
1. Approved Product:
a.) Hubbell #HUBPR10120

E. Telecommunications Grounding Busbar and Accessories.
1. Approved Product:
a.) Hubbell #HUBRKTGB (TMGB)
b.) Hubbell #HUBMCCGBAR (rack mounted grounding bus)
c.) Panduit #PANGB4B0624TPI-1(TMGB)
d.) Panduit #PANGB2B0312TPI-1 (TGB)
e.) B-Line #BLNSBTMGB12K (TMGB)
f.) B-Line #BLN57903 (rack mounted grounding bus)

g.) Panduit
h.) Bline
i.) Other Products as required to meet all codes and standards.

2.15 EQUIPMENT TRAY FOR TELECOMMUNICATION ROOMS

A. All equipment tray shall be 18" in width or as indicated on prints and UL listed. The tray shall have 1 ½" stringers and rungs that are fully adjustable from 6" to 12" spacing within the tray. The tray shall be black in color and be made of aluminum.

B. Furnish and install 18" equipment tray from each floor; mount rack/server cabinet to wall. Furnish and install 18" equipment tray around wall as required to support cables. (A minimum of two (2) walls shall be completely covered by equipment tray) unless otherwise indicated on prints.
1. Approved Product:
   a.) B-Line #BLNSB13AL18FB (18" Redi-Rail tray)
   b.) B-Line #BLNSB117ABZ (Cable retaining post)
   c.) B-Line #BLNSB2276FB (6" elevation bracket)

2.16 HORIZONTAL DISTRIBUTION CABLE

A. All horizontal voice and data station cables shall terminate on modular patch panels in their respective telecommunication room or equipment room as specified on the drawings.

B. All cable, workstation jack modules and patch panel jack modules shall be the same color as designated on prints. If colors are not designated, coordinate color with engineer.
1. UTP cabling - Horizontal Copper Cable; Category 6 Cable
2. Cable construction shall be four (4) twisted pairs of 23 American Wire Gauge (AWG) insulated solid bare annealed copper conductors.
3. Outer jacket shall meet National Electrical Code (NEC) requirements and have a nominal cable diameter not to exceed 0.235" for communications riser (CMR) and 0.225" for communications plenum (CMP).
4. Cable shall have a minimum 1.0" bend radius.
5. Application assurance warranty.
   a.) All transmission performance parameters shall be independently verified by UL or ETL third party testing organization.
6. Approved Product:
   a.) HCM part #'s as indicated below:
      1) Category 6 CMP Blue
      2) Category 6 CMP White
      3) Category 6 CMP Green
   b.) Hubbell part #'s as indicated below:
      1) HUBC6SPB Hubbell Category 6 CMP Blue
      2) HUBC6SPW Hubbell Category 6 CMP White
      3) HUBC6SPGN Hubbell Category 6 CMP Green
   c.) General Cable GS6 CMP
   d.) Southwire CMP

2.17 BACKBONE FIBER CABLING SYSTEM

A. Furnish and install a minimum of a 6-strand OM3 multimode fiber from MDF to each IDF. Any fiber length that exceeds 1600ft, furnish a minimum of a 6-strand singlemode fiber in addition to the multimode, unless otherwise indicated on backbone riser diagram.

B. See riser diagram.

C. All indoor fiber shall be tight buffered interlock armored fiber.

D. All indoor/outdoor fiber shall be tight buffered optical fiber nonconductive plenum (OFNP) rated and shall be installed in innerduct rated for the appropriate application.

E. All outdoor fiber shall be loose tube and shall be installed in innerduct rated for the appropriate application.

F. All multimode fiber shall be 50/125 OM3.
   1. Approved Product:
      a.) HCM part #'s as indicated below:
         1) HCM61337-6 (6-strand interlock armored OFNP 50/125 OM3 300 meters 10Gig)
         2) HCM61337-12 (12-strand interlock armored OFNP 50/125 OM3 300 meters 10Gig)
         3) HCM61337-24 (24-strand interlock armored OFNP 50/125 OM3 300 meters 10Gig)
         4) HCM61433-6 (6-strand interlock armored OFNP singlemode)
         5) HCM61433-12 (12-strand interlock armored OFNP singlemode)
         6) HCM61433-24 (24-strand interlock armored OFNP singlemode)
         7) HCM61348-6 (6-strand tight buffered indoor/outdoor OFNP 50/125 OM3 300 meters 10Gig)
         8) HCM61348-12 (12-strand tight buffered indoor/outdoor OFNP 50/125 OM3 300 meters 10Gig)
         9) HCM61348-24 (24-strand tight buffered indoor/outdoor OFNP 50/125 OM3 300 meters 10Gig)
         10) HCM61459-6 (6-strand tight buffered indoor/outdoor OFNP singlemode)
         11) HCM61459-12 (12-strand tight buffered indoor/outdoor OFNP singlemode)
         12) HCM61459-24 (24-strand tight buffered indoor/outdoor OFNP singlemode)
         13) General Cable
         14) Panduit

2.18 PROJECT MANAGEMENT

A. The installation shall be performed under the direction of a qualified project manager and the costs of all such direction shall be included with the contractor's bid. The contractor shall install the materials and equipment in a first class workmanlike manner and in accordance with all applicable federal, state, and local fire and safety codes.

B. Contractor shall be required to maintain a copy of this document and an up-to-date set of customer supplied prints on site during all phases of the project. In addition, all personnel working on the project will be required to be familiar with the contents of this document.

C. The installing contractor shall have technical expertise in the installation and provision of the selected switch, it is incumbent on the successful contractor to provide coordination with all parties concerned, including both local and long distance telephone service suppliers, to ensure all necessary features and hardware components are provided**.** The Contractor must inform customer immediately upon discovery of any issues, including lack of or delay in obtaining critical information that would affect a successful Cut over. Assumptions regarding configuration and service must not be made and any questions regarding alternatives are to be brought to **Engineers** attention for a decision.

2.19 DATABASE DESIGN

A. When creating the customer site database, the contractor must conduct endpoint reviews, otherwise referred to as "station reviews" with designated department personnel to receive input for customization. The database record must be maintained throughout the project in Excel format and include the following, at a minimum:
   1. Extension
   2. First and Last Name
   3. Building
   4. Floor
   5. Department
   6. Function or Title
   7. Jack Number
   8. Cable Pair
   9. Cable Reference
   10. Name Display Data
   11. Restriction Service Class
   12. Service Feature Class

2.20 CUTOVER

A. Cutover to the new system shall be conducted according to the written, mutually agreed upon cutover plan which will detail the date and time for system cutover as well as the order in which system components including critical endpoints will be cutover to the new system. It is the Contractors responsibility to write the proposed cutover plan and submit for proofing and approval.

2.21 TRAINING

A. Training must be comprehensive and cover all functions and procedures necessary for operation of the new system at the user or System Admin level. Training materials, such as instruction manuals, quick reference charts and cards, overlays and reference manuals must be supplied in the quantities associated with relevant Schedule A endpoints and systems and must become the property of customer.

2.22 SYSTEM ADMINISTRATION TRAINING

A. Contractor is required to provide basic on site system administration training for up to 4 employees on all new systems installed. This training must be live and conducted both prior to cutover lasting a minimum of 2 hours and after cutover to include another session lasting a

minimum of 1 hour.

2.23 SYSTEM MANUALS

A. Contractor is required to provide one full set of System Manuals, including copies of all User Guides, Installation and Maintenance Guides, Features and Specifications, Programming Manuals and Troubleshooting Help Guides as part of the turnkey solution.

2.24 ACCEPTANCE

A. Contractor is responsible for the system, as proposed, being installed to **customers'** satisfaction. Prior to System Acceptance, Contractor must complete the following:

B. Adjust all applicable equipment components for operation

C. Ensure all trunking and equipment is routed per **customers'** functional requirement and all local telephone company lines are identified.

D. Provide the **customer** with complete user instructions used for training purpose as well as Training log of all users who attended training classes.

E. All endpoints must be labeled accurately.

F. The system must be fully installed and tested to ensure operation with feature functionality as described in the manufacturer's specification.

G. Ensure all peripheral system interfaces are tested and working properly.

2.25 WARRANTY COVERAGE

A. If the contractor will be using subcontractors for onsite installation and/or subsequent service of the system for maintenance, the contractor must provide a detailed explanation of the their business relationship to the subcontractor, including length of relationship, how many hours per month the subcontractor is used and references of other customers of the contractor where the subcontractor is used and is known to the referenced customer.

B. Emergency response terms must be defined so that the contractor must dispatch and be on site within 4 hours of live notification if emergency condition cannot be corrected remotely.

C. Emergency conditions must include any trunk group outage in excess of 25%, any data group or endpoint outage in excess of 25%, any Attendant position outage, or any other outage that severely impacts **customers'** normal business operations.

D. Non-emergency repair response terms must define that the contractor must dispatch and be onsite within 48 hours.

E. Non-emergency MAC (moves, adds, changes) terms must be defined that the contractor must dispatch and be onsite within 120 hours.

F. In all emergency conditions, the contractor must log into the affected system remotely, if possible, within 1 hour of notification.

G. The contractor must provide a one year warranty on all material and labor supplied with the proposed system.

2.26 NETWORK ELECTRONICS

A. All network equipment (Hubs, Switches, Routers, etc.) shall be provided and installed by owner.

B. Wireless electronics and supporting equipment shall be provided and installed under this contract.

2.27 NETWORK ELECTRONICS

A. All network equipment (Hubs, Switches, Routers, etc.) shall be provided and installed by owner.

PART 3 - EXECUTION

3.1 PRIOR SITE INVESTIGATION

A. Prior to start of system, meet at the project site with owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the general contractor will be necessary to plan the crucial schedule completions of the equipment room and telecommunication closet.

B. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

3.2 INSTALLATION GUIDELINES

A. The work included under this specification, consist of furnishing all labor, equipment, material, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specification or not.

B. All work performed on this project will be installed in accordance with the current edition of the NEC, the current edition of The National Electrical Safety Code, the current issue of the NEC, The current edition of ANSI/NECA/BICSI-568 standard for installing commercial building telecommunications cabling, the current edition of the BICSI Telecommunications Distribution Methods Manual (TDMM), the current edition of the BICSI Cabling Installation Manual, the latest issue of ANSI/TIA/EIA standards as published Global Engineering Documents as ANSI/TIA/EIA Telecommunications Building Wiring Standards, and all local codes and ordinances. Should conflicts exist with the foregoing, the authority having jurisdiction (AHJ) for enforcement will have responsibility for making interpretation.

C. If this document and any other documents listed above are in conflict, then the more stringent requirements shall apply. All documents listed are believed to be the most current release of the documents. The structured cabling contractor has the responsibility to determine and adhere to the most current release.

D. This document does not replace any code, either partially or wholly. The structured cabling contractor must be aware of local codes that may impact this project. All, local, State and federal codes are to be followed.

E. All materials shall be UL Listed or listed by other national independent testing agency and shall be marked as such.

F. Section Includes: Equipment, materials, labor, and services to provide a complete structured cabling system including, but not limited to:
   1. Furnish and install a complete telecommunications wiring infrastructure.
   2. Furnish, install, terminate and test all copper and optical fiber cables.
   3. Furnish and install raceway, boxes, and cable tray.
   4. Furnish and install all wall plates, jacks, patch panels, and patch cords as described.
   5. Furnish and install all required cabinets and/or racks as required and as indicated.
   6. Furnish any other material required to form a complete system.
   7. Perform link testing (100% of horizontal and/or backbone links) and certification of all components. All tests must meet or exceed link testing requirements as specified in this document.
   8. Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.
   9. Provide owner test results and documentation. (Testing documentation and as-built drawings).
   10. Removal of abandoned cable, if required.

3.3 WORK NOT INCLUDED

A. Unless otherwise indicated, the structured cabling contractor is not responsible for providing data concentrators, hubs, switches, servers, computers, and other active devices such as PBX's.

3.4 INSTALLATION

A. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local AHJ, and current NEC and with manufacturer's instructions.

B. Install in accordance with manufacturer's instructions.

C. All cable shall conform to the requirements for communications circuits defined by the NEC (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one (1) floor.

D. Adhere to manufacturer’s specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.
   1. Where manufacturer does not provide bending radii information, minimum-bending radius shall be 4 times the outside diameter of the cable. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.

E. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be fire stopped after installation and testing, utilizing a fire stopping assembly for that application.

F. Install station cabling to the nearest telecommunications room (TR), unless otherwise noted.

G. Installation shall conform to the following basic guidelines.
   1. Use of approved wire, cable, and wiring devices.
   2. Neat and uncluttered wire termination.

H. Where cable tray is not used, attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables above removable ceilings.

I. Follow manufacturer's recommendations on spacing and number and type of cables installed in cable tray to avoid cable stress.

J. Separation and physical barriers between communication cabling and power cables must be maintained at all times.

K. Install adequate support structure for 10 feet of service slack at each TR.

L. Support riser cables every three (3) floors and at top of run with cable grips.

M. Limit number of four-pair data riser cables per grip to fifty (50).

N. Install cables in one continuous piece. Splices or taps will not be allowed.

O. Provide overvoltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.

3.5 GROUNDING

A. Grounding shall conform to ANSI-J-STD 607(A) Commercial Building Grounding and Bonding Requirements for Telecommunications, NEC, ANSI/NECA/BICSI-568 and manufacturer's grounding requirements as minimum.

B. Bond and ground equipment racks, housings, messenger cables, and raceways.

C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 (at a minimum) green insulated copper grounding conductor.

3.6 LABELING

A. Label each outlet with permanent self-adhesive label.

B. Label each cable within 1" of termination on each end.

C. Use labels on face of patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities therein.

D. Use color-coded labels for each termination field that conforms to ansi/TIA/EIA-606(A) standard color codes for termination blocks.

E. Labels shall be machine-printed. Hand-written labels shall not be acceptable.

F. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in date.

G. Three (3) sets of as-built drawings shall be delivered to the owner within two (2) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner in electronic form utilizing CAD software that is acceptable to the owner. The electronic media shall be delivered to the owner within four (4) weeks of acceptance of project by owner.

3.7 TESTING

A. Testing shall conform to ANSI/TIA/EIA-568-B.1 standard. Testing shall be accomplished using a level IIe or higher field testers.

B. All testing shall meet or exceed manufacturer's recommendation for 25-year warranty program.

C. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded and reversed pairs.

D. If copper backbone cable contains more than one (1%) percent bad pairs, remove and replace entire cable.

E. If horizontal cable contains bad conductors or shield, remove and replace cable.

F. Test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14a: OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant and ANSI/TIA/EIA-526-7 Measurements of Optical Power Loss of Installed Singlemode Fiber Cable Plant. Measure results shall be plus/minus 1 dB of submitted loss budget calculations. Correct improper splices and replace damaged cables at no charge to the owner.

G. Cables shall be tested at 850 and 1300 nm for multimode optical fiber cables. Cables shall be tested at 1310 and 1550 for singlemode optical fiber.
   1. Testing procedures shall utilize "Method B"- one jumper reference.
   2. Bi-directional testing of optical fiber is required.
   3. Submit printout for each cable tested. The use of handwritten test results will not be acceptable.

3.8 FIELD QUALITY CONTROL

A. Employ job superintendent or project manager during the course of the installation to provide coordination of work of this specification and of other trades, and provide technical information when requested by other trades. This person shall maintain current RCDD registration and shall be responsible for quality control during installation, equipment set-up, and testing.

B. Installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.

END OF STRUCTURED CABLING

SECTION 16721

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install a complete low voltage, automatic and manual fire alarm system as specified herein and indicated on the drawings.

B. The system shall include power supply, signal initiating devices, audible and visual alarm devices, a conduit and wiring system and all necessary accessories required to provide a complete operating system.

C. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 for fire alarm systems; N.E.C. Article 760; and meet all requirements of the local authorities having jurisdiction.

1.2 DESCRIPTION OF SYSTEM

A. Conduit, outlet boxes, cabinets, devices and wiring installation for complete fire detection and alarm system. Plenum rated cabling may be installed above accessible ceilings with the approval of the local inspecting authority.

B. Each and every item of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer that is currently listed by Underwriter's Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOBZ as a single control unit. Partial listing shall not be acceptable. System controls shall be UL listed for Power Limited Applications per N.E.C. Article 760. All circuits shall be marked in accordance with N.E.C. 760-23.

C. Wiring shown is diagrammatic to define system and is not intended to show every wire. Review drawings prior to bidding and inform Contractor of any additional wiring necessary for installation of systems. Include cost of all wiring in bid.

D. Submit complete shop drawings of system for review including terminal to terminal connection diagrams for system components and associated equipment interfaces, conduit diagrams, complete descriptive information on each item of equipment including UL listing for all system components, and any other information required by Architect to describe system. Identify color code and terminal numbers on shop drawings.
   1. After completion of work, submit one set of record mylar sepias with items for Owner described above. Typical type drawings will not be accepted.

E. Manufacturer's trained technical representative shall supervise installation, connections and tests. The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring. Before acceptance, manufacturer's representative will test and certify in writing that system is installed and functioning properly as intended by drawings and specifications. Test includes operation of all devices in entire system.

F. The fire alarm system shall have an integrated off premise communications capability using a Digital Alarm Communications Transmitter (DACT) for sending system events to multiple Central Monitoring Station (CMS) receivers. The system shall provide the CMS(S) with point

identification of system events using contact ID protocol. The dialer shall have the capability to support up to two (2) individual accounts and to send account information to two (2) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being directed to one or more receivers depending on event type or location as specified by the system designed. In the event of a panel CPU failure during a fire alarm condition, the DACT degraded mode shall transmit a general fire alarm signal to the CMS. Automatic telephone dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless approved by the fire chief. It is the fire alarm contractor's responsibility to coordinate with the owner/architect for transmission paths for the fire alarm control panel (FACP) to be monitored by an approved supervising station in accordance with NFPA72.

G. The Certified Fire Alarm Act became law in Alabama on August 1, 2009 and is enforced effective August 1, 2012. The law 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 Certified Fire Alarm Act and holds a permit issued by the State Fire Marshall.

H. Guarantee entire system in writing for one year from date of acceptance by Owner. Guarantee will cover completely all components, equipment, wiring, etc. Repair any defects found in the system within the guarantee period without cost to owner.

I. Submit with bid a guaranteed price for complete maintenance and service of system for one year beginning at expiration of guarantee period. Price shall be guaranteed for acceptance by Owner until date of substantial completion of system.

1.3 SYSTEM OPERATION

A. Actuation of any alarm initiating device shall cause all audible alarm signals to sound, all visual indicating appliances to flash, cause a red LED on the actuated zone module at the control panel/annunciator to light, provide a signal to the mechanical controls to shut down or re-route air handling systems according to established plans. This shall include a suitable addressable relay at each air handling unit to shut down all air handlers in a given zone when system goes into alarm. In addition all magnetically held doors shall close automatically.

B. The general alarm devices may be silenced by authorized personnel only, by entering a locked cabinet and operating the proper silencing switch. A subsequent zone alarm shall reactivate the signals. Operation of the silencing switch shall be indicated by a trouble light and audible signal.

C. Operation of any pull station, power failure, opens, grounds, or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced; however, the trouble LED shall remain lit until the system has been returned to normal operating condition.

D. Analog Smoke Sensor Operation
   1. The smoke sensor shall be a smoke density measuring device having no self contained alarm set-point. The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the

sensor value to stored values.

2. The control panel shall maintain a moving average of the sensors smoke chamber value. Systems that do not automatically maintain a constant smoke obscuration sensitivity for each sensor by compensating for environmental factors and are deemed unacceptable.
3. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "Dirty Sensor" trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location.
   a. If a "Dirty Sensor" is left unattended, and its average value increases to a second predetermined value, an "Excessively Dirty Sensor" trouble condition shall be indicated at the control panel for the individual sensor.
4. The control panel shall automatically perform a daily self-test on each sensor. Checking the electronics in the sensor's base ensures the accuracy of the values being transmitted to the control panel. A sensor which fails the self-test will cause a "Self Test Abnormal" trouble condition at the control panel. A sensor self-test which must be manually initiated by the operator shall not be acceptable.

1.4 SYSTEM FEATURES

A. The fire alarm system shall include the following features as a minimum:
   1. Supervision of all field wiring.
   2. Microprocessor based solid state modular construction.
   3. 80 character LCD display to indicate alarms, supervisory service conditions and troubles.
   4. Earth ground supervision circuit.
   5. "Dead Front" design control panel/annunciator with field programmable LED alarm, status and trouble indicators, and all control switches located behind a locked tempered glass door.
   6. Alarm LED and trouble LED for each zone.
   7. Simultaneous test of all LED's from a central point.
   8. Fully automatic battery charger and lead alkaline batteries. Batteries shall have capacity to maintain system operation for 24 hours in normal supervisory mode and shall have sufficient capacity remaining to operate in alarm mode for 15 minutes at conclusion of supervisory period. Batteries shall be supervised for connection to the system and for low voltage threshold. Ammeter and voltmeter shall be provided to indicate battery voltage and charging current.
   9. 2 amp form C auxiliary alarm contacts fused with feedback.
   10. 2 amp form C auxiliary trouble contacts.
   11. Up to 64 class A or class B initiating device circuits (zones) capable of handling 50 addressable alarm initiating devices.
   12. Up to 64 two amp alarm indicating circuits.
   13. System shall be field programmable for offsite monitoring by remote station reverse polarity, local energy master box or shunt master box types.
   14. System shall be field programmable for signal circuit type of operation; march time code, temporal code, selective code, zone code, general alarm, time limit cutout and alarm silence inhibit.
   15. Supervised remote annunciator connection circuit.
   16. Basic 5 amp power supply (expandable as required).
   17. Resident non-volatile programmable operating system memory for all operating requirements.
   18. 100 event historical logging.

B. Each zone shall have its own individual alarm indicating light and trouble indicating light.

PART 2 - PRODUCTS

2. 1 FIRE ALARM CONTROL PANELS/ANNUNCIATORS

A. Furnish and install control panels and annunciators as shown on plans.

2.2 ALARM STATIONS - ADDRESSABLE

A. Furnish break glass stations as shown on the plans. The station body shall be so constructed that chips and scratches will not expose metal. All stations shall be master keyed with the control equipment. When actuated, the "Pull Lever" shall remain at right angle to the station body until reset.

B. Furnish stations with institutional cover where shown on drawings.

2.3 PHOTOELECTRIC SMOKE SENSOR

A. The addressable smoke sensors shall be of the photoelectric type and shall communicate actual smoke chamber values to the system control panel.

B. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

C. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.

D. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

E. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

F. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

G. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.

H. Provide a U.L. listed sensor guard for sensors in areas subject to tampering. The guard shall be suitable for ceiling or sidewall mounting and hinged for easy access. The guard shall be securely mounted with tamper-proof screws.

2.4 ADDRESSABLE PHOTOELECTRIC DUCT DETECTOR

A. The detector shall be a non-polarized 24VDC type which is compatible with the Fire Alarm Panel and obtains its operating power from the supervisory current in the fire alarm detection loop. It shall be of

the same analog type as the ceiling smoke detectors. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.

B. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector may be reset by actuating the control panel reset switch.

C. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel.

D. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). It shall be possible to alarm the duct housing by using a test switch. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

E. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.

2.5 HEAT DETECTORS

A. Addressable Thermal Sensors: Shall operate on the "fixed temperature" principle with the sensor having a set point of 135 degrees F, The sensor shall contain dual thermistor sensing circuitry for fast response.
B. LEDs: Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. LEDs shall pulse periodically indicating that the sensor is receiving power and communication is being supplied. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. Alarm output shall be available for remote annunciation.
C. Interchangeable Sensors: Each sensor shall be interchangeable via twistlock mounting base. To ensure matching proper sensor to potential hazards of areas being protected, the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

2.6 ALARM SIGNALS (AUDIBLE)

A. The horn shall be polarized and shall be operated by 25VRMS. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall NOT be accepted. Where horns are shown as a combination audio-visual assembly, they shall be mounted as a combination unit in a single back box. Horns shall be capable of producing 88dB and shall be tapped for 2 watt connection.

B. Audio/visual devices required to be surface mounted shall be furnished with surface mounting box and adaptor plate.

2.7 ALARM SIGNALS (VISUALS)

A. Furnish and install visible appliance for fire alarm system notification. The appliance shall be 1HZ

synchronized 30 cd with polar distribution or 75 cd illumination as required by the Americans with Disabilities Act (ADA). The appliance shall be U.L. listed to Standard 1971 and have a circumpolar light output allowing mounting in either vertical or horizontal positions or on the ceiling.

1. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the light pattern in key axis directions.
2. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8 inches. In its quiescent state, the word "FIRE" shall be visible.
3. Mounting heights of visual appliances shall in all respects comply with the Americans with Disabilities Act.
4. Visual indicating appliances shall be comprised of a Xenon flashtube and be entirely solid state. These devices shall be U.L. listed and be capable of either ceiling or wall mounting. The LEXAN lens shall be pyramidal in shape to allow better visibility. Visual units shall be of the stand alone type.

2.8 AUXILLARY FUNCTIONS

A. Electromagnetic Door Holders.
   1. Hold fire and smoke barrier doors open until released by alarm.
   2. Holding Power: Approximately 35 pounds (15.9-kg).
   3. Offer fail-safe operation.
   4. Capable of operation on 12 VDC, 24 VAC, 24 VDC, or 120 VAC interchangeably without need of configuration.
   5. Holders: Release through contacts of control panel after alarm has been initiated from any zone. If 120 vac is used for door holders, provide an isolation relay mounted near the door holders to isolate 120 vac from control panel.
   6. Circuits: Separately fused.

2.9 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers:
   1. Gamewell Fire Control Instruments.
   2. SimplexGrinnell
   3. GE/Edwards EST.
   4. Honeywell.

C. All equipment shall be listed by UL. All panels and peripheral devices shall be the standard equipment of a single manufacturer and shall display the manufacturer's name on each component.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if

required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor. All junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the installation.

B. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

C. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

D. The manufacturer's authorized representative shall provide on site supervision of installation.

E. The manufacturer's authorized representative shall have as a minimum, a NICET LEVEL II certification.

3.2 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor.

3.3 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

3.4 CERTIFICATION & ACCEPTANCE

A. A factory trained representative of the manufacturer shall supervise final testing of the system in accordance with N.F.P.A. Standard 72H-1984 in the presence of a representative of the authority having jurisdiction. Manufacturer's representative shall be NICET trained and shall have a level II NICET certificate. It shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.

B. The fire alarm system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year from the date of acceptance or beneficial occupancy whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

C. The equipment manufacturer shall be represented by a service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall be located within 50 miles of the job site. The service organization shall furnish, gratis to the Owner, a one year maintenance warranty contract, effective from the date of final acceptance.

D. Electrical contractor is responsible for insuring the fire alarm system is certified and coordinating with the owner to insure system is being monitored before Life Safety/Final inspections as per the requirements of the State Building Commission. These requirements also mandate the Local Fire Marshall to be in attendance. It is suggested the contractor provide documentation of his efforts to achieve the above.

END OF FIRE ALARM SYSTEM

SECTION 16910

OCCUPANCY SENSORS

PART 1 - GENERAL

1.1 SUMMARY

A. The Occupancy Sensor system shall sense the presence of human activity within the desired space and fully control the "On" / "Off" function of the lights.

B. Sensing technologies shall be completely passive meaning that they will not emit any radiation that is known to interfere with certain types of hearing aides, or electronic devices such as electronic white board readers. Acceptable programmable shall be Passive Infrared (PIR), and/or PIR/Microphonic Passive Dual Technology (PDT). Ultrasonic or Microwave based sensing technologies shall not be accepted.

C. Time Delay settings shall be factory set at 10 minutes, and shall not be field adjusted unless specifically instructed by Architect. This delay selection is based on lamp life vs. energy savings and sensor performance. Automatic adjustments to this delay period by the sensor shall not be permitted.

D. In high humidity or cold environments, the sensors must be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.

E. Installer, in accordance with manufacturer's recommendation, shall determine final sensor location. All sensors shall have non-adjustable factory calibrated sensitivity for maximum performance. Time Delay and Photocell field adjustments shall be provided as needed.

F. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

G. All applicable products must be UL Listed or other acceptable national testing organization.

H. Product must be manufactured in the USA and be warranted for 5 years.

1.2 APPROVED MANUFACTURER AND SUBSTITUTIONS

A. Approved manufacturer shall be Sensor Switch, Inc. (800) 727-7483 www.sensorswitch.com

B. Substitutions must be submitted no less than 5 days prior to bid date. An AutoCAD drawing of the facility showing coverage patterns and technical data must be provided with substitution request. All substitutions must clearly identify any and all exceptions to the specifications with a detailed explanation as to the exception. If substitution is approved, the contractor shall bear the responsibility of a fully functional system to the owner's and Architect's satisfaction.

PART 2 – PRODUCTS

2.1 WALL SWITCH SENSORS – SMALL AREAS

A. Sensor shall recess into single gang switch box and fit a standard GFI opening.

B. Sensor must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.

C. Sensor shall use PIR sensing incorporating a nominal one half inch focal length lens viewing 9 inches above and below horizontal view pattern measured at 10 feet.

D. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, and no switch as specified.

E. In areas with inboard/outboard switching, sensor shall provide two dedicated relays and override switches. Each relay shall have independent programmable time delays.

F. In areas with obstructions to the occupant's workspace, sensor shall utilize programmable dual technology PIR/Microphonic sensing.

G. All models shall have "Reduced Turn On". This is a field programmable function for problematic areas with unforeseen reflective surfaces. False turn on shall be eliminated with this feature.

H. Sensor shall be the following Sensor Switch model numbers. Device color and optional features as specified.

1. WSD (PIR)

2. WSD-2P (PIR inboard/outboard)

3. WSD-PDT (PIR/Microphonic)

4. WSD-PDT-2P (PIR/Microphonic inboard/outboard)

5. WSD-SA (PIR Semi-Automatic)

6. WSD-PDT-SA (PIR/Microphonic Semi-Automatic)

2.2 WALL SWITCH SENSORS – LARGE AREAS

A. Sensor shall surface mount to single gang switch box.

B. Sensor shall use PIR sensing incorporating a nominal one-inch focal length lens viewing 9 inches above and below horizontal view pattern measured at 20 feet.

C. Sensor shall have optional feature for photocell/daylight override.

D. In areas with inboard/outboard switching or two circuits, sensor shall provide two dedicated relays and override switches.

E. In areas with obstructions to the occupant's workspace, sensor shall utilize dual technology PIR/Microphonic sensing.

F. Sensor shall be the following Sensor Switch model numbers. Device color and optional features as specified.

1. LWS (PIR)

2. LWS-2P (PIR inboard/outboard or two circuits)

3. LWS-PDT (PIR/Microphonic)

4. LWS-PDT-2P (PIR/Microphonic inboard/outboard or two circuits

2.3 LOW VOLTAGE SENSORS

A. Sensors shall operate on a class 2, three-conductor system. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 milliamps so that up to 14 sensors may be connected to a single power pack.

B. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.

C. In areas with clear line of site view of the workspace, sensors shall use PIR detection. In areas with obstructions, sensors shall use PIR/Microphonic detection.

D. Optional interface with Building Automation System (BAS): Each zone designated shall provide one sensor with a SPDT class 2 relay providing a digital input to BAS. All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that Power Pack must be installed on the Line side of the local toggle switch for Relay to work properly.

E. Specific sensors shall have optional feature for photocell/daylight override, and/or Low Temperature/High Humidity environments.

F. Sensors shall be the following Sensor Switch model numbers.

1. CM-9 (PIR Ceiling)

2. CM-PDT (PIR/Microphonic Ceiling)

3. CM-10 (PIR Ceiling-Extended Range)

4. CM-PDT-10 (PIR/Microphonic Ceiling-Extended Range)

5. WV-16 (PIR Wall Mount)

6. WV-PDT (PIR/Microphonic Wall Mount)

7. HW-13 (PIR Hallway)

8. HM-10 (PIR High Bay Aisle Way)

9. CM-6 (PIR High Bay)

2.4 POWER PACKS

A. Power Packs shall accept 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.

B. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.

C. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.

D. Power Pack shall incorporate a Class 1 relay and an A/C electronic switching device. The A/C electronic switching device shall make and break the load, while the relay shall carry the current in the On condition. This system shall provide full 20 amp switching of all load types, and be rated for 400,000 cycles.

E. Power Packs shall be single circuit, or two circuits. Slave Packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.

F. Power Packs shall be the following Sensor Switch model numbers.

1. PP-20 (Single Pole)

2. PP-20-2P (Two Pole)

3. SP-20 (Slave Pack)

2.5 PHOTOCELLS AND DIMMING/DAYLIGHT HARVESTING

A. Photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.

B. Photocell shall provide for an On/Off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.

C. Photocell set-point and deadband shall be automatically calibrated through the sensor's micro-controller by initiating the "Automatic Set-point Programming" subroutine. Further adjustment may be made manually if needed. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

D. Low voltage Dimming Sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable ballasts by sinking up to 20 milliamps of class 2 current (typically 40 or more ballasts).

E. Low voltage Dimming Sensor's set point shall be automatically calibrated through the sensor's micro-controller by initiating the "Automatic Set-point Programming" subroutine. Min and Max dim settings as well as set-point may be manually entered.

F. Low voltage Dimming Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)

G. Combination Photocell/Dimming Sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the On/Off function as well as the dimming function of 0 to 10 VDC dimmable ballasts.

H. Combination Photocell/Dimming Sensor's set-point and deadband shall be automatically calibrated through the sensor's micro-controller by initiating the "Automatic Set-point Programming" subroutine. Min and Max dim settings as well as set point may be manually entered.

I. Combination Photocell/Dimming Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)

J. Dual zone option shall be available for Photocell, Dimming Sensors, or Combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.

K. Stand alone Ambient Light Sensors shall interface directly with the 0 to 10 VDC, without any other power source connection, and control dimmable ballasts by sinking up to 20 milliamps of class 2 current. Sensor shall incorporate a photodiode viewing out of a ceiling enclosure at a 30 degree angle from horizontal to detect diffused light from the ambient and artificial sources. Sensor shall allow for removal of response delays for adjustment, however provide dampening delay for normal operation. Settings shall be made manually.

L. Sensors shall be the following Sensor Switch model numbers.

1. CM-PC (Photocell for On/Off)

2. CM-ADC (Dimming Sensor)

3. CM-PC-ADC (Combination Photocell/Dimming Sensor)

4. CM-PC-DZ, CM-ADC-DZ, OR CM-PC-ADC-DZ (Dual Zone Version)

5. CM-ALC (Stand Alone Ambient Light Sensor for Daylight Harvesting)

2.6 LINE VOLTAGE SENSORS

A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack.

B. In areas with clear line of site view of the workspace, sensors shall use PIR detection. In areas with obstructions, sensors shall use PIR/Microphonic detection.

C. Multiple sensors controlling the same load shall be wired in parallel.

D. Wall Mounted Sensors must be installed at 7 to 8 feet above the floor. Single and two circuit units shall be available.

E. High Bay sensors controlling HID Bi-Level must incorporate a Start to High timer on initial power up to provide full light output for up to 20 minutes to prevent shortened lamp life.

F. Specific sensors shall have optional feature for Low Temperature/High Humidity environments.

G. Sensors shall be the following Sensor Switch model numbers.

1. CMR-9 & CMR-9-2P (PIR Ceiling Mount- single and two pole)

2. CMR-PDT & CMR-PDT-2P (PIR/Microphonic Ceiling Mount- single and two pole)

3. CMR-10 & CMR-10-2P (PIR Ceiling Mount Extended Range - single and two pole)

4. CMR-PDT-10 & CMR-PDT-10-2P (PIR/Microphonic Ceiling Mount Extended Range - single and two pole)

5. WVR-16 & WVR-16-2P (PIR Wall Mount single and two pole)

6. WVR-PDT & WVR-PDT-2P (PIR/Microphonic Wall Mount single and two pole)

7. HMR-10 (PIR High Bay Aisle Way)

8. CMR-6 & CMR-6-SH (High Bay Ceiling)

END OF OCCUPANCY SENSORS

SECTION 16726

CCTV SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1 - General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

1.2 GENERAL SCOPE OF WORK

A. The Contractor shall furnish and install a fully operational site controlled, complete, and satisfactorily operating CCTV system at each location as indicated on the drawings for the monitoring and recording of associated activities adjacent to and within the building.

B. System to be provided complete with manufacturer recommended cabling to be installed by vendor. Electrical contractor to provide raceways and boxes.

C. System to be provided complete with manufacturer recommended cabling to be installed by vendor. Electrical Contractor to provide raceways and boxes.

D. System shall be designed and installed by the Owner select system vendor.

1.3 DESCRIPTION OF WORK

A. Provide all labor, equipment, materials, hardware, and software for a complete CCTV system.

B. Provide wiring and electrical connection to each 24vdc camera.

C. Provide wiring at locations indicated in drawings back to the main data backboard in the electrical/communication room as shown on plan as required or directed by Enterprise State IT staff.

1.4 QUALITY ASSURANCE

A. All equipment and materials for this system shall be listed by Underwriter's Laboratories, Inc. (UL), bear the UL label, and shall be installed in accordance with all requirements of the National Electric Code (NEC), with all state and local codes, and with these Specifications.

B. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

C. The Contractor shall furnish submittals for all components of the CCTV Surveillance System in accordance with Section 16000 of these Specifications. Submittal shall include the following for review. Submittals which do not contain all the information listed below will be rejected.

1. A complete list by model number of each component of the system with a statement of how many pieces of each model will be furnished and a listing of the specific data sheet associated with it.

2. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. CCTV surveillance cameras shall be addressed as showing on the Drawings. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. The layout of all CCTV Surveillance camera equipment and devices shall be that which is shown on the Drawings.

3. The CCTV cameras shall be furnished by a factory-authorized distributor certified to design, program, and service the system. The distributor must certify the following:

a. Successful training and support of a similar system, as specified, for a minimum of five (5) years.

b. Twenty-four hours (24), seven (7) day a week (including holidays) service capability.

c. A maximum four (4) hour service call response time.

D. The cameras shall be installed, connected, tested, and left in first-class operating condition 24/7.

1.5 DOCUMENTATION

A. The Contractor shall furnish four (4) bound copies of complete operating and maintenance instructions of the system to the Owner including circuit diagrams and all other information necessary for proper operation, service, and maintenance.

B. The Contractor shall furnish to the Owner a set of “as-built” drawings complete with field wiring diagrams.

1.6 DESCRIPTION OF OPERATION

A. The CCTV cameras approved by Owner shall be furnished and installed as shown on the Drawings and as specified herein and shall function as follows:

1. Cameras shall be compatible with Owner’s Video Management System and tested by the Manufacturer for full integration and functionality.

2. Each camera’s purpose shall be pre-defined by the Owner based upon location-subject matter, expected field of view (F.O.V.), physical surroundings, lighting and obstructions.

3. Cameras shall be IP based and comply with established network and video standards.

4. Cameras shall, at the minimum, utilize H.264 compression (MPEG-4 AVC) for video encoding at 30 frames/second.

5. Cameras shall have the ability to encrypt video streams to the Owner's server.

6. Cameras shall have the following security built in: Password protection, IP address filtering, HTTPSa encryption, IEEE 802.1Xa network access control, digest authentication, user access log, centralized certificate management, and brute force delay protection.

7. Cameras shall have the ability to record motion events to an on-board SD card in the event of a network outage. In the event of a post-network outage, the data from the SD card shall automatically be sent to the Owner's server for official storage.

8. Cameras shall have the ability to reduce bandwidth consumption, reduce server storage size, and limit bit rate. Acceptable methods to ensure that relevant forensic information is identified recorded and sent in full resolution and at full frame rate to the video server is through Dynamic ROI, Dynamic GOP, and Dynamic FPS technologies.

9. Cameras shall have at the least the following built-in analytics without additional fees from manufacturer:

    1. Video Motion Detection.
    2. Active Tampering Alarm.

10. Cameras shall be powered by the switch utilizing network cable. Power injectors shall be provided and installed by the Contractor where required to maintain specified level of operation.

11. Cameras shall be fully support by an open API for software integration including camera application platform. ONVIF Profile S and ONVIF Profile G.

12. Cameras shall comply with relevant ONVIF (global standard for the interface of IP-based physical security products).

13. Cameras shall have the ability to trigger the following events: Analytics, edge storage events, virtual inputs through API.

14. Cameras shall have the ability to respond to event actions. Record video to an SD card and network share; Upload of images or video clips via FTP, SFTP, HTTP, HTTPS, network share and email; Pre- and Post- alarm video or image buffering or recording or ; Upload notification: email, HTTP, HTTPS, TCP and SNMP trap; Overlay text.

15. Cameras shall have support for micro SD/microSDH/microSDXC card support for recording to a dedicated network-attached storage (NAS) for SD card and NAS.

1.7 SYSTEM TEST AND ACCEPTANCE

A. The Contractor shall conduct an operating test of the complete system including each device. The system shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.

B. The Contractor shall perform all tests in the presence of the Owner's representative. The Contractor shall furnish all required personnel for use in the test.

C. When contractual work on the system is ready for final review, a site visit shall be arranged by the Owner's representative. The Contractor shall demonstrate that the requirements of the Contract, as it applies to this system, have been carried out, and that the system has been adjusted and operates in accordance herewith.

1.8 WARRANTY

A. The Contractor shall deliver the work in first-class operating condition in every respect. The Contractor shall warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to Section 01740 for the start of the warranty period. fully warranted from the manufacturer for a minimum of three (3) years from the date of final acceptance. Labor, cabling, and workmanship shall be fully warranted by the Contractor for a minimum of one (1) year from the date of final acceptance.

1.9 SPARE PARTS

A. The Contractor shall furnish to the Owner spare parts as follows. All spare parts shall be furnished to the Owner prior to the turnover of the first phase of the system.

1. One (1) spare camera of each type listed in the contract drawings.
2. Two (2) power injectors identical to those installed.

1.10 RECOMMENDED SYSTEM CONTRACTORS AND MANUFACTURERS

A. The following are the recommended System Contractors and manufacturers:

Company Name	Manufacturer	Address/Location	Contact Number
Harris Security		2780 US-231 Ozark, AL	334.774.8564
Vucan Security Systems		530 Beacon Pkwy #502 Birmingham, AL	205.290.9404
Vision Security Technologies		143 Business Center Dr. Birmingham, AL	205.663.3332

Note:
1. Contact vendor to coordinate Work responsibilities and to obtain cost for inclusion in the contract price. Any approved equals or substitute company/manufacturers must be sent to the Engineer for approval.

1.11 QUALIFICATIONS OF BIDDER

A. All bidders must be security systems contractors in the business of installing CCTV systems for a minimum of 3 years.

B. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Engineer in writing.

C. Spare parts shall be available for at least 5 years after completion of this contract.

1.12 CODES AND STANDARDS

A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)
2. Standard Building Code

B. If the drawings and/or specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

1.13 SUBMITTALS

A. Furnished by System Vendor. Submit product data for all system components and low voltage cabling to be furnished under this Section.

B Furnished by System Vendor. Contractor shall provide shop drawings of complete system design. Show building plan with equipment and device locations and interconnecting wiring. Indicate wire and cable type, size, and quantities. Provide wiring diagrams to indicate wire color coding and termination points for system equipment. No work may begin on any segment of this project until submittals have been reviewed and approved for conformity with the design intent.

C. Submit electronic (PDF) format copy of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.

D. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.14 OPERATION AND MAINTENANCE DATA

A. Include data for complete system in Operation and Maintenance Manuals.

PART 2 – PRODUCTS

2.1 CCTV SYSTEM COMPONENTS

A. Provided by System Vendor. Components shall include cameras, wiring, power supplies and any associated components for mounting and supporting each camera device.

B. Acceptable Manufacturer – Verkada Cameras will only be accepted.

Parts: **CONFIRM AND COORDINATE WITH OWNER BEFORE PURCHASE**

1. Interior Camera: VERKADA CD41 – 30 Days of Storage
2. Exterior Camera: VERKADA CD41E – 30 Days of Storage

2.2 WIRING

A. This Contractor shall furnish and install CCTV camera cables where shown on the Drawings and specified herein. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, No. 23 AWG, category 6, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. BERK-TEK Cat. No 10136748 (Green) or equal as manufactured by AMP, BELDEN, CORNING, GENERAL CABLE, MOHAWK, OPTICAL CABLE CORP., PAIGE, SIECOR, SUMITOMO ELECTRIC, or WEST PENN

B. All wiring for the CCTV system shall be terminated in the main and sub distribution frames on the designated CCTV patch panel as shown on the drawings and herein specified.

C. All wiring for the CCTV camera(s) shall be terminated with a RJ-45 (568A) connector. The Contractor shall leave twenty-five (25) feet of slack in the wiring for CCTV camera termination.

D. Cable certification test results of CCTV camera cables shall be furnished to the Owner prior to turnover.

2.3 WIRING – SYSTEM TEST AND ACCEPTANCE

A. Prior to Owner acceptance, the Contractor shall conduct an operating test of all CCTV telecommunications system cabling. The cabling shall test free from grounds, shorts, and other faults. All connections shall be checked for mechanical and electrical connection.

B. The Contractor shall perform the following tests, certifying each Telecommunications outlet Cat

6 cable. Test results shall be tabulated listing each outlet (by number), the cable, and the test results.

TEST	FREQUENCY	REQUIREMENTS
1. Impedance:	1 MHz	100 ohms ± 15%
	10 MHz	
	25 MHz	
	100 MHz	
	250 MHz	
2. Attenuation:	1 MHz	2 dB max. per 100m
	10 MHz	6 dB max. per 100m
	25 MHz	9.5 dB max. per 100m
	100 MHz	19.8 dB max. per 100m
	250 MHz	32.8 dB max per 100m
3. Crosstalk (Next):	1 MHz	min. 62 dB
	10 MHz	min. 47 dB
	25 MHz	min. 41 dB
	100 MHz	min. 44.3 dB
4. PS-Next (min)	100 MHz	42.3 dB
5. EL-FEXT (min)	100 MHz	27.8 dB
6.PS- ELFEXT (min)	100 MHz	24.8 db
7. Return Loss (min)	100 MHz	20.1 dB
8. Delay Skew (max)	100 MHz	45 nS

9. Mutual Capacitance: less than 46 pf per meter

10. Cable Length: less than 100 meter

C. Each fiber optic cable shall have a FOIRL specification, bi-directional testing at both 850 nm and 1300 nm with 3 db light signal loss per km and 2000/500 MHz- km bandwidth at 850/1300nm.

D. The Contractor shall perform all tests in the presence of the Architect/Engineer. The Contractor shall furnish all personnel and instruments required for use in all required tests

E. The Contractor shall provide the cable certification test results to the Owner prior to turnover of finished work. The results should include cable ID, camera designation number, and communication closet designator. Results shall be submitted in bound hard copy 8 ½" x 11" format.

F. The Contractor shall be prepared, upon request by the Owner, to exhibit current ownership of all instruments and equipment necessary to perform all required tests.

2.4 BASIC MATERIALS AND ACCESSORIES

A. 120 Volt Circuits: As specified in Section 16120 for 600 Volt.

B. Low Voltage Cable and Connectors: Provided by system Vendor.

C. Boxes, Conduit, Raceway, Device Plates: Comply with Section 16130.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Equipment and Devices.

1. Install and test per manufacturer's requirements.

2. Provide demonstration and training as required.

B. Wiring

1. Comply with requirements of Section 16120 & 16710, except minimum conduit size shall be ¾ inch. Exposed wiring is permitted only above accessible lay-in ceilings and ceiling spaces open to structure.

2. Comply with requirements of Section 16050 & 16120. Exposed wiring is permitted only above lay in accessible ceilings and ceiling spaces open to structure.

3. Install conductors in metallic conduit except wiring may be open cabling where installed in concealed accessible ceiling spaces and in cable trays.

4. Consistently color code wiring throughout per Shop Drawings. Do not splice conductors. Terminate conductors at screw terminals of equipment and devices.

5. Leave 12 inches minimum cable slack at each camera and monitor termination. Leave 36 inches minimum cable slack for each head end termination.

C. Requirements for Open Cable

1. Install cabling parallel and perpendicular to building lines.

2. Cable installation shall comply with NEC 300-4 where installed through studs, joists, rafters, and similar structural members.

3. Secure cable by straps or J-hooks so designed and installed as not to damage the cable, at intervals not exceeding 3ft (36").

4. Protect cables with plastic bushing through end of raceways runs, device plates and outlet boxes.

5. Provide conduit sleeves for installing open signal cables through fire rated construction and through partition walls above accessible ceilings.

6. When exposed cabling is routed in air-return plenum, plenum rated cable is required.

3.2 TESTING

A. Test conductors for continuity prior to cover.

B. Test complete CCTV system including each request to each camera and demonstrate satisfactory operation in presence of Owner and his representatives. Furnish all equipment, etc., required for testing.

END OF CCTV SURVEILLANCE SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK