

PROJECT MANUAL



**Verbena High School Gymnasium
202 County Road 510
Verbena, Alabama
Chilton County Board of Education**

**BID
DOCUMENTS**

**DCM No. 2025629
WSM Project No. 25-032
DATE: January 8, 2025**

OWNER: Chilton County Board of Education 1705 Lay Dam Rd Clanton, Alabama 35045 (205) 280-3000	MECHANICAL/ ELECTRICAL/ PLUMBING ENGINEER: Smith, Stegall & Associates, PC 2110 Eighth Street Tuscaloosa, Alabama 35401 (205) 345-4402
ARCHITECT: Ward Scott Morris Architecture, Inc. 1606 Paul Bryant Drive Tuscaloosa, Alabama 35401 (205) 345-6110	STRUCTURAL ENGINEER: Barnett Jones Wilson 631 Helen Keller Blvd, Ste 400 Tuscaloosa, Alabama 35404 (205) 345-9595
CIVIL ENGINEER: TTL, Inc. 10 Inverness Center Parkway Birmingham, Alabama 35242 (205) 401-7470	

TABLE OF CONTENTS

BIDDING DOCUMENTS

Invitation to Bidders
 Instructions to Bidders, DCM Form C-2, Oct 24
 Proposal Form, DCM Form C-3, Aug 21
 Accounting of Sales Tax Attachment to DCM Form C-3 Proposal Form, DCM Form C-3A, April 25
 Form of Bid Bond, DCM Form C-4, Feb 24

CONTRACTUAL DOCUMENTS

Preparation and Approval of Construction Contracts and Bonds Checklist, DCM Form B-7A, Oct 24
 Construction Contract, DCM Form C-5, June 23
 E-Verify Memorandum of Understanding
 Disclosure Statement of Relationships between Contractors/Grantees
 And Public Officials/Employees Pursuant to Executive Order #55
 Performance Bond, DCM Form C-6, July 22
 Payment Bond, DCM Form C-7, July 22
 General Conditions of the Contract, DCM Form C-8, Dec 24
 Supplementary General Conditions
 Permit Fee & Permit Re-Inspection Fee Calculation Worksheet
 Pre-Construction Conference Checklist, DCM Form B-8, Oct 24
 Pre-Roofing Conference Checklist, DCM Form B-8A, Oct 25
 Asbestos Affidavit
 Application and Certification for Payment, DCM Form C-10, July 22
 Schedule of Values, DCM Form C-10SV, Oct 21
 Inventory of Stored Materials, DCM Form C-10S, Oct 21
 Final Payment Checklist, DCM Form B-13, Oct 24
 Progress Schedule and Report, DCM Form C-11, Aug 21
 Change Order Guidance, DCM Form B-12A, Sept 23
 Contract Change Order, DCM Form C-12, June 23
 Change Order Justification, DCM Form B-11, Aug 21
 Certificate of Substantial Completion, DCM Form C-13, Nov 22
 Form of Advertisement for Completion, DCM Form C-14, Feb 24
 Detail of Project Sign, DCM Form C-15, Dec 21
 Contractor's Affidavit of Payment of Debts and Claims, DCM Form C-18, Aug 21
 Contractor's Affidavit for Release of Liens, DCM Form C-19, Aug 21
 Consent of Surety for Final Payment, DCM Form C-20, Aug 21
 Contractor Guarantee
 General Contractor's Roofing Guarantee, DCM Form C-9, Aug 21
 Final Payment General Release and Indemnity Agreement

DIVISION 01 - GENERAL REQUIREMENTS

011000 ----SUMMARY
 012100 ----ALLOWANCES
 012200 ----UNIT PRICES
 012500 ----SUBSTITUTION PROCEDURES
 012600 ----CONTRACT MODIFICATION PROCEDURES
 012900 ----PAYMENT PROCEDURES
 012910 ----SALES AND USE TAX SAVINGS
 013100 ----PROJECT MANAGEMENT AND COORDINATION
 013200 ----CONSTRUCTION PROGRESS DOCUMENTATION
 013300 ----SUBMITTAL PROCEDURES
 014000 ----QUALITY REQUIREMENTS
 014100 ----STRUCTURAL TESTS & SPECIAL INSPECTIONS
 014200 ----REFERENCES
 015000 ----TEMPORARY FACILITIES AND CONTROLS
 016000 ----PRODUCT REQUIREMENTS
 017000 ----EXECUTION REQUIREMENTS
 017400 ----WARRANTIES
 017700 ----CLOSEOUT PROCEDURES
 017810 ----PROJECT RECORD DOCUMENTS

DIVISION 02 – EXISTING CONDITIONS

022102 ----EXISTING UTILITIES
 024060 ----SITE DEMOLITION

DIVISION 03 – CONCRETE

- 032000---- CONCRETE REINFORCING
- 033000---- CAST-IN-PLACE CONCRETE
- 033543---- POLISHED CONCRETE FINISHING

DIVISION 04 – MASONRY

- 042000---- UNIT MASONRY
- 047200---- CASTON STONE MASONRY

DIVISION 05 - METALS

- 051200---- STRUCTURAL STEEL FRAMING
- 054000---- COLD-FORMED METAL FRAMING
- 055000---- METAL FABRICATIONS
- 055213---- PIPE AND TUBE RAILINGS

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

- 061000---- ROUGH CARPENTRY
- 061600---- SHEATHING
- 061753---- SHOP FABRICATED WOOD TRUSSES
- 064116---- PLASTIC LAMINATE FACED ARCHITECTURAL CABINETS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

- 072100---- THERMAL INSULATION
- 072726---- FLUID-APPLIED MEMBRANE AIR BARRIERS
- 076200---- SHEET METAL FLASHING AND TRIM
- 079200---- JOINT SEALANTS

DIVISION 08 - OPENINGS

- 081113---- HOLLOW METAL DOORS AND FRAMES
- 081416---- FLUSH WOOD DOORS
- 083313---- COILING COUNTER DOORS
- 084113---- ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
- 087100---- DOOR HARDWARE
- 088000---- GLAZING

DIVISION 09 - FINISHES

- 092216----NON-STRUCTURAL METAL FRAMING
- 092900----GYPSUM BOARD
- 093013---- CERAMIC TILING
- 095113----ACOUSTICAL PANEL CEILINGS
- 096466---- WOOD ATHLETIC FLOORING
- 096513----RESILIENT BASE AND ACCESSORIES
- 096519----RESILIENT TILE FLOORING
- 096723---- RESINOUS FLOORING
- 098403---- ACOUSTIC ROOM COMPONENTS
- 099123---- INTERIOR PAINTING
- 099600---- HIGH-PERFORMANCE COATINGS

DIVISION 10 - SPECIALTIES

- 101100---- VISUAL DISPLAY UNITS
- 101423---- ROOM-IDENTIFICATION PANEL SIGNAGE
- 102113---- PLASTIC TOILET COMPARTMENTS
- 102800---- TOILET, BATH AND LAUNDRY ACCESSORIES
- 104413---- FIRE PROTECTION CABINETS
- 104416---- FIRE EXTINGUISHERS
- 105113---- METAL LOCKERS
- 105300---- METAL WALKWAY COVERS
- 105613 --- METAL SHELVING

DIVISION 11 - EQUIPMENT

- 112300---- COMMERCIAL LAUNDRY EQUIPMENT
- 116623---- GYMNASIUM EQUIPMENT

DIVISION 12 – FURNISHINGS

- 122113---- HORIZONTAL LOUVER BLINDS
- 123623---- PLASTIC-LAMINATE-CLAD COUNTERTOPS
- 123661.16-SOLID SURFACING COUNTERTOPS
- 126600---- TELESCOPING STANDS

DIVISION 13 - SPECIAL CONSTRUCTION

- 133419---- METAL BUILDING SYSTEMS

DIVISION 21 – FIRE SUPPRESSION

210500 ----COMMON WORK RESULTS FOR FIRE SUPPRESSION
211300 ----FIRE-SUPPRESSION SPRINKLER SYSTEMS

DIVISION 22 – PLUMBING

220553 ----IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220719 ----PLUMBING PIPING INSULATION
221005 ----PLUMBING PIPING
221006 ----PLUMBING PIPING SPECIALTIES
224000 ----PLUMBING FIXTURES

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING

230010 ----COMMON HVAC REQUIREMENTS
230553 ----IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593 ----TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 ----DUCT INSULATION
232300 ----REFRIGERANT PIPING
233100 ----HVAC DUCTS AND CASINGS
233300 ----AIR DUCT ACCESSORIES
233700 ----AIR OUTLETS AND INLETS

DIVISION 26 – ELECTRICAL

260519 ----LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 ----GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 ----HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260534 ----CONDUIT
260537 ----BOXES
260553 ----IDENTIFICATION FOR ELECTRICAL SYSTEMS
260928 ----LIGHTING CONTROL SYSTEM
262416 ----PANELBOARDS
262717 ----EQUIPMENT WIRING
262726 ----WIRING DEVICES
262818 ----ENCLOSED SWITCHES
263305 ----BATTERY EMERGENCY POWER SUPPLY
264300 ----SURGE PROTECTIVE DEVICES
265100 ----INTERIOR LIGHTING
265600 ----EXTERIOR LIGHTING

DIVISION 27 – COMMUNICATIONS

270001 ----COMMUNICATIONS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

283100 ----FIRE ALARM SYSTEMS
285000 ----RF SURVEY FOR IN-BUILDING TWO-WAY EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT
285001 ----IN-BUILDING TWO-WAY EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM

DIVISION 31 - EARTHWORK

311000 ----SITE PREPARATION, GENERAL
311100 ----CLEARING AND GRUBBING
312000 ----GEOTECHNICAL REPORT
312200 ----EARTHWORK
312205 ----PREPARATION OF SUBGRADE
312250 ----TRENCHING, BACKFILL, AND COMPACTION
313116 ----TERMITE CONTROL

DIVISION 32 - SITE CONSTRUCTION

322240 ----CRUSHED AGGREGATE BASE
322272 ----RIPRAP
322290 ----SLOPE PROTECTION AND EROSION CONTROL
322500 ----ASPHALT PAVING
322528 ----CONCRETE CURB AND GUTTER
322830 ----SOLID SOD
322900 ----TOPSOIL
322920 ----SEEDING AND MULCHING
322940 ----PAINTING AND STRIPING
322945 ----CAST-IN-PLACE CONCRETE - CIVIL

DIVISION 33 - UTILITIES

332433 ----STORM SEWERS
332600 ----DUCTILE IRON PIPE AND FITTINGS
332607 ----PRECAST CONCRETE MANHOLES AND COVERS

- 332614---- HDPE GRAVITY PIPE & FITTINGS
- 332622---- POLYVINYL CHLORIDE GRAVITY SEWER PIPE
- 332625---- POLYVINYL CHLORIDE WATER PIPE
- 332660---- WATER SYSTEM
- 332662---- RESILIENT SEATED GATE VALVES
- 332664---- VALVE BOXES AND VAULTS
- 332666---- SERVICE CONNECTIONS
- 332668---- FIRE HYDRANTS
- 332670---- BACKFLOW PREVENTION
- 332672---- WATER SERVICE RELOCATION
- 332722---- SANITARY SEWER SYSTEM
- 332729---- THRUST RESTRAINT

CIVIL TECHNICAL SPECIFICATIONS INDEX

022102	Existing Utilities
024060	Site Demolition
311000	Site Preparation, General
311100	Clearing and Grubbing
312000	Geotechnical Report
312200	Earthwork
312205	Preparation of Subgrade
312250	Trenching, Backfill, and Compaction
322240	Crushed Aggregate Base
322272	Riprap
322290	Slope Protection and Erosion Control
322500	Asphalt Paving
322528	Concrete Curb and Gutter
322830	Solid Sod
322900	Topsoil
322920	Seeding and Mulching
322940	Painting and Striping
322945	Cast-in-Place Concrete - Civil
332433	Storm Sewers
332600	Ductile Iron Pipe and Fittings
332607	Precast Concrete Manholes and Covers
332614	HDPE Gravity Pipe & Fittings
332622	Polyvinyl Chloride Gravity Sewer Pipe
332625	Polyvinyl Chloride Water Pipe
332660	Water System
332662	Resilient Seated Gate Valves
332664	Valve Boxes and Vaults
332666	Service Connections
332668	Fire Hydrants
332670	Backflow Prevention
332672	Water Service Relocation
332722	Sanitary Sewer System
332729	Thrust Restraint



INDEX TO STRUCTURAL SPECIFICATIONS

01 4100 - STRUCTURAL TESTS & SPECIAL INSPECTIONS

Statement of Special Inspections

Schedule of Special Inspections

Final Report of Special Inspections

03 2000 – CONCRETE REINFORCING

03 3000 - CAST IN PLACE CONCRETE

05 1200 – STRUCTURAL STEEL FRAMING

06 1753 – SHOP FABRICATED WOOD TRUSSES

Prepared by Barnett Jones Wilson, LLC:



TABLE OF CONTENTS

DIVISION 21 - FIRE SUPPRESSION

- 210500 COMMON WORK RESULTS FOR FIRE SUPPRESSION
- 211300 FIRE-SUPPRESSION SPRINKLER SYSTEMS

DIVISION 22 - PLUMBING

- 220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
- 220719 PLUMBING PIPING INSULATION
- 221005 PLUMBING PIPING
- 221006 PLUMBING PIPING SPECIALTIES
- 224000 PLUMBING FIXTURES

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

- 230010 COMMON HVAC REQUIREMENTS
- 230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- 230713 DUCT INSULATION
- 232300 REFRIGERANT PIPING
- 233100 HVAC DUCTS AND CASINGS
- 233300 AIR DUCT ACCESSORIES
- 233700 AIR OUTLETS AND INLETS



01/08/26

DIVISION 26 - ELECTRICAL

- 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 260534 CONDUIT
- 260537 BOXES
- 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 260928 LIGHTING CONTROL SYSTEM
- 262416 PANELBOARDS
- 262717 EQUIPMENT WIRING
- 262726 WIRING DEVICES
- 262818 ENCLOSED SWITCHES
- 263305 BATTERY EMERGENCY POWER SUPPLY
- 264300 SURGE PROTECTIVE DEVICES
- 265100 INTERIOR LIGHTING
- 265600 EXTERIOR LIGHTING



01/08/26

DIVISION 27 - COMMUNICATIONS

- 270001 COMMUNICATIONS

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

- 283100 FIRE ALARM SYSTEMS
- 285000 RF SURVEY FOR IN-BUILDING TWO-WAY EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM
- 285001 IN-BUILDING TWO-WAY EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM

INVITATION TO BIDDERS

Sealed proposals will be received by the Chilton County Board of Education, until 2:00 P.M., legally prevailing time, on February 10, 2026 for the Verbena High School Gymnasium at the Chilton County Board of Education, 1705 Lay Dam Road, Clanton, Alabama, at which time and place they will be publicly opened and read.

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

Drawings and Specifications may be examined at the office of the Architect, Ward Scott Morris Architecture, Inc., 1606 Paul Bryant Drive, Tuscaloosa, Alabama, and TuscaBlue, 2806 Greensboro Avenue, Tuscaloosa, Alabama.

Bid documents may be obtained from TuscaBlue via www.ward-scottplans.com, upon deposit of \$100.00 per set, which will be refunded in full on the first two sets issued to each trade contract bidder submitting a bona fide bid, upon return of documents in good condition within ten days of bid date. Other sets for contractors, and sets for dealers, may be obtained with the same deposit, which will be refunded as above, less cost of printing, reproduction, handling, and distribution. Electronic PDF copies of bid documents may be procured free of charge.

Bid bonds are to be issued by an acceptable bonding company licensed to do business in the State, with a Power of Attorney, to confess judgment thereon, with the understanding that it shall guarantee that the bidder shall not withdraw his bid for the guarantee period of sixty (60) days after the scheduled closing time for the receipt of bids; that if his bid is accepted, he will enter into a formal contract with the Owner, and that in the event of a withdrawal of said bid within said period, or the failure to enter into said contract within the time specified, the bidder shall be liable to the Owner for the full amount of the bid guarantee as liquidated damages and not as a forfeit or as a penalty. The bid bond and certified checks on unsuccessful bidders will be returned upon awarding the contract or rejection of all bids, in no event, later than the number of days in the guarantee period from the opening of proposals. That of the successful bidder will be returned when formal contract and bonds are accepted and approved.

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

All Bidders are invited to attend a non-mandatory pre-bid conference to be held electronically via Zoom at 10:30 A.M. on January 27, 2026. Participants can join the video presentation by going to <https://zoom.us/join> or via conference call at +1(312) 626-6799. Please enter the Meeting ID#: 869 6486 6446 & Passcode: 590509 at the website and on the conference call when prompted. The bidder's company employee attending the pre-bid conference shall have qualifications and experience with the construction to be performed within this project. Any questions concerning the pre-bid conference shall be directed to the Architect.

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

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. Determination of Low Bidder by Use of 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, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

2. GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

When the amount bid for a contract is **\$100,000 or more**, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. In case of a joint venture of two or more contractors, the amount of the bid shall be within the maximum bid limitation as set by the State Licensing Board for General Contractors of the combined limitations of the partners to the joint venture.

3. QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

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

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

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

4. PREFERENCE to RESIDENT CONTRACTORS:

(If this project is federally funded in whole or in part, this Article shall not apply.)

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

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

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

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

6. EXPLANATIONS and INTERPRETATIONS:

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

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

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

7. SUBSTITUTIONS:

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

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

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

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

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

8. PREPARATION and DELIVERY of BIDS:

a. DCM Form C-3: Proposal Form:

- (1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted. A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with the Proposal Form.
- (2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.
- (3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:
 - (a) the legal name of the bidder,
 - (b) the state under which laws the bidder's business is organized and existing,
 - (c) the city (and state) in which the bidder has its principal offices,
 - (d) the bidder's business organization, i.e., corporation, partnership, or individual (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and
 - (e) the partners or officers of the bidder's organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert "See Attachment" in this space and provide the listing on an attachment to the Proposal Form.
- (4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.
- (5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.
- (6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.
- (7) The Proposal Form shall be properly signed by the bidder. If the bidder is:
 - (a) **an individual**, that individual or his or her "authorized representative" must sign the Proposal Form;
 - (b) **a partnership**, the Proposal Form must be signed by one of the partners or an "authorized representative" of the Partnership;
 - (c) **a corporation**, the president, vice-president, secretary, or "authorized representative" of the corporation shall sign and affix the corporate seal to the Proposal Form.

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

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

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

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

c. Bid Guaranty

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

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

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

d. Delivery of Bids:

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

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

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

9. WITHDRAWAL or REVISION of BIDS:

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

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

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

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

10. OPENING of BIDS:

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

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

11. INCOMPLETE and IRREGULAR BIDS:

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

12. BID ERRORS:

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

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

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

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

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

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

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

13. DISQUALIFICATION of BIDDERS:

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

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

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

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

14. CONSIDERATION of BIDS:

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

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

15. DETERMINATION of LOW BIDDER by USE of ALTERNATES:

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

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

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

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

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

16. UNIT PRICES:

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

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

17. AWARD of CONTRACT:

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

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

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

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

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

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

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

END of INSTRUCTIONS TO BIDDERS

PROPOSAL FORM

To: _____ Date: _____
(Awarding Authority)

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

(Legal Name of Bidder)

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

in accordance with Drawings and Specifications, dated _____, prepared by
_____, Architect/Engineer.

The Bidder, which is organized and existing under the laws of the State of _____,
having its principal offices in the City of _____,
is: a Corporation a Partnership an Individual (other) _____.

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

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

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

BASE BID: For construction complete as shown and specified, the sum of _____ Dollars (\$ _____)

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

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

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

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

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

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

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

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

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

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

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

BIDDER'S ALABAMA LICENSE:

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

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

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

Legal Name of Bidder _____

Mailing Address _____

* **By (Legal Signature)** _____

* Name & Title (print) _____ (Seal)

Telephone Number _____

Email Address _____

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

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

ACCOUNTING OF SALES TAX

Attachment to DCM Form C-3: Proposal Form

To: _____ Date: _____
(Awarding Authority)

NAME OF PROJECT _____

SALES TAX ACCOUNTING

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

ESTIMATED SALES TAX AMOUNT

BASE BID: \$ _____

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

Alternate No. 2 (.....) (add) (deduct) \$ _____

Alternate No. 3 (.....) (add) (deduct) \$ _____

Alternate No. 4 (.....) (add) (deduct) \$ _____

Alternate No. 5 (.....) (add) (deduct) \$ _____

Alternate No. 6 (.....) (add) (deduct) \$ _____

Legal Name of Bidder _____

Mailing Address _____

***By (Legal Signature)** _____

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

(Seal)

***Title** _____

Telephone Number _____

Email Address _____

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

UNIT PRICES

Attachment to DCM Form C-3: Unit Prices

1.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Unsuitable Soils

1. Undercutting unsuitable soils, disposing of material off site, and replacing with offsite borrow structural fill compacted in place.

Unit Price per Cubic Yard In Place \$ _____

B. Unit Price No. 2: Reinforcing Steel

1. Reinforcing steel in place and installed as directed by the Owner, Architect, Engineer or the Construction Manager.

Unit Price per Ton in Place \$ _____

C. Unit Price No. 3: Concrete

1. 3000 psi Concrete in place and installed as directed by the Owner, Architect, Engineer or the Construction Manager.

Unit Price per Cubic Yard in Place \$ _____

D. Unit Price No. 4: BDA System

1. The BDA systems shall bid as follows:
 - a. Base Bid: Initial Survey of Building as described in specification section 285000
 - b. Unit Price: Installation and testing of the BDA system as per plans and specification section 285001

BID BOND

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

Name:

Address:

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

Name:

Address:

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

Name:

Address:

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

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

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

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

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

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

SIGNED AND SEALED this _____ day of _____, _____.

ATTEST:

PRINCIPAL:

By _____

Name and Title

SURETY:

ATTEST:

By _____

Name and Title

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

**PREPARATION AND APPROVAL OF
CONSTRUCTION
CONTRACTS and BONDS
SUBMITTED ELECTRONICALLY**

CHECKLIST

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

CONSTRUCTION CONTRACT - DCM Form C-5 or DCM Form 9-A (PSCA Projects)	
The numbers in the left column below correspond to numbers in the left margin of the Contract form.	
(1)	PROJECT NUMBER(S): DCM will insert the DCM Project Number in the field provided. <ul style="list-style-type: none"> On DCM Form 9-A, insert the PSCA Project Number in the field provided.
(2)	DATE: Do not select a date beyond today's date.
(3)	OWNER: Insert the full, legal name, address, email, and telephone number of the Owner (Awarding Authority). <ul style="list-style-type: none"> On DCM Form 9-A, insert the name, address, email, and telephone number of the Local Owner (city or county school board, college, university, etc.) after "Alabama Public School and College Authority"
(4)	CONTRACTOR: Insert the Contractor's company name, correct mailing address, email, and telephone number. For State Agency projects, the Contractor Company name and address must match the name and address registered in the State of Alabama Accounting and Resource System (STAARS) or AL Buys (if registered), used by most State Agencies to pay Vendors. The Contractor Company name and address must be consistent across all documents in the same contract package, in order to avoid Comptroller's Office rejection. <ul style="list-style-type: none"> On DCM Form 9-A: The Contractor Company name and address must match the name and address registered in STAARS or AL Buys used by the State to pay Vendors. The Contractor Company name and address must be consistent across all documents in the same contract package, in order to avoid Comptroller's rejection.
(5)	The WORK: Insert the complete name of the Project; same as in the Bid Documents.
(6)	CONTRACT DOCUMENTS: Insert the date of the Bid Documents
(7)	ADDENDA: Identify, by number and date, all pre-bid Addenda that were issued to the Bid Documents. If none were issued, insert "None". All Addenda shall be submitted to DCM for review prior to contract issuance.
(8)	ARCHITECT: Insert the full, legal name, address, email, and telephone number of the Project Architectural or Engineering firm.
(9)	CONTRACT SUM: The Contract Sum is the total of the Contract's Base Bid and accepted Bid Alternate Prices, if any. Insert the Contract Sum in words and figures, verifying that this amount corresponds with the CERTIFIED TABULATION OF BIDS.
(10)	BID ALTERNATE PRICES: Identify which, if any, Bid Alternate Prices are accepted and included in the Contract Sum by inserting either (a) "No Alternate Prices Requested in Bid", (b) "No Alternate Prices Accepted", or (c) a listing of the accepted Alternates by number and dollar amount.
(11)	The CONTRACT TIME: State the Contract Time in words and in figures.
(12)	LIQUIDATED DAMAGES: If the Owner has computed a daily rate for liquidated damages, insert the amount in both words and figures in the spaces provided.
(13)	SPECIAL PROVISIONS: This space may be used to incorporate Special Provisions into the Contract, such as unit prices, compliance with enacted provisions, and value engineering. If the solicitation for bids required Unit Prices, insert a statement of which Unit Prices, if any, are accepted and incorporated into the Contract. If more space is needed, Special Provisions may be stated on an attachment that is cited in the Special Provisions section. <ul style="list-style-type: none"> DCM Form 9-A is published bearing Special Provision "A. Severable Payments", which is where the portions of the Contract Sum to be paid by the PSCA and the Local Owner are to be stated. Obtain these amounts from Local Owner and insert them in the spaces provided. Other Special Provisions, such as disposition of Unit Prices, may be inserted below this provision.
(14)	STATE GENERAL CONTRACTOR'S LICENSE: Insert the Contractor's current state general contracting license number, bid limit, and classification in the spaces provided.

(15)	SIGNATURES - APPROVING and CONTRACTING PARTIES The documents will forward to the signers in sequential order.
PERFORMANCE BOND, DCM Form C-6 or DCM Form 9-B (PSCA Projects), and PAYMENT BOND, DCM Form C-7 or DCM Form 9-C (PSCA Projects) Required for contracts of \$100,000.0 or more, with surety’s power-of-attorney - required per Section 39-2-8 of the Code of Alabama.	
(1)	SURETY’S BOND NUMBER should be inserted in the field provided.
(2)	PRINCIPAL: Contractor’s name and address is to be the same as appears in the Construction Contract.
(3)	SURETY: The full, legal name and address of the bonding company.
(4)	OWNER: The Owner’s name and address is to be the same as appears in the Construction Contract.
(5)	PENAL SUM: The Penal Sum of each Bond is to be the Contract Sum of the Construction Contract and is to be inserted in both words and figures.
(6)	The Date of the Construction Contract: The date that appears on the Construction Contract.
(7)	The PROJECT: The same name or description as appears in the Construction Contract.
(8)	DATE: After “SIGNED AND SEALED” is to appear the date upon which Surety signs the Bond. THIS DATE CANNOT PRECEDE THE DATE OF THE CONSTRUCTION CONTRACT.
(9)	CONTRACTOR’S SIGNATURE: The Contractor’s name must appear beneath “CONTRACTOR”, under which the signature of a member or officer of the firm must appear with the name and title of the signing party appearing beneath the signature.
(10)	SURETY’S SIGNATURE: The full, legal name of the bonding company must appear under “SURETY”, under which the signature of an individual having power of attorney for the bonding company must appear with the individual’s name and title appearing beneath the signature.
(11)	ATTACHED POWER OF ATTORNEY: Attached to each of the Bonds must be a Power of Attorney, signed by an officer of the bonding company, for the individual e-signing the bond on behalf of the bonding company. The date of the Power of Attorney <u>must not precede the date of the bond.</u>

ATTACHMENTS

The following documents must be attached to the Construction Contract:

- Insurance Certificate (attach copy): It is the responsibility of the design professional to ensure all insurance requirements are discussed with bidders prior to a bid and that Contractor has provided the requirements to their insurance provider. Contractor must obtain all insurance coverage specified in Article 37 of the General Conditions of the Contract - required per Section 39-2-8 of the Code of Alabama.
- Surety’s power-of-attorney: Required for Performance Bond, which is required for contracts of \$100,000.00 or more per Section 39-2-8 of the Code of Alabama.
- Surety’s power-of-attorney: Required for Payment Bond, which is required for contracts of \$100,000.00 or more per Section 39-2-8 of the Code of Alabama.
- Certified Tabulation of Bids (attach copy): Required for all projects including those with informal bids -required per Section 39-2-6 of the Code of Alabama.
- DCM Form C-3: Proposal Form (attach copy): If bid proposal was adjusted by notation on outside of envelope, also attach copy of outside of envelope including notation.
- DCM Form C-3A: Accounting of Sales Tax (attach copy): Attachment must be of the executed C-3A from the bid -required per Section 40-9-14.1 of the Code of Alabama.
- E-Verify Memorandum of Understanding (attach copy): Entire document required - required per Section 31-13-25(b) of the Code of Alabama.
- Alabama Vendor Disclosure Statement - required per Section 41-16-82 of the Code of Alabama. Contractor must mail one original completed wet-signed notarized and dated hardcopy to DCM along with DCM Form: Transmittal of Alabama Vendor Disclosure Statement. DCM will perform a review, and if the document is correct, will attach a scan of the Disclosure Statement to the Contract.

DCM USER FEES:

- **PSCA-Funded Projects & Fully Locally-Funded State Agency Projects:** The Contract Document Administration Fee-CC and the Permit Fee must be paid by the time a Construction Contract for a PSCA-funded project or state agency/authority project is submitted to DCM for review, or when a fully locally-funded project Construction Contract is converted to PSCA. Contract reviews can begin once the fees have been paid.
- **Fully Locally-Funded K-12 Projects:** The Permit Fee must be paid by the time a copy of a fully locally-funded K-12 school project's executed Construction Contract is received at DCM's office from the State Department of Education (SDE). * See Permit Fee exception below.

- **General Information:**

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

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

Basic Permit Fee: This fee covers required project inspections. The Permit Fee **must be paid before a construction contract is reviewed by DCM, or** becomes due when a self-performance letter **or fully locally-funded K-12 construction contract** is received by DCM, and must be paid before a Pre-Construction Conference is scheduled with DCM Inspectors*

Note: Although DCM does not review the construction contracts of fully locally-funded public K-12 projects, the Permit Fee must be paid before the required Pre-Construction Conference is scheduled with DCM Inspectors for such projects.*

* Exception: Permit Fees are not owed for fully locally-funded public K-12 projects with an estimated cost of \$750,000.00 or Less for capital improvement or alterations, additions, repair, or maintenance of heating, ventilation, and air conditioning systems or any alterations, additions, repair, or maintenance of a roof; all such projects are still subject to DCM pre-construction conferences and inspections.

∇ Determination of whether or not a project is in the \$750,000.00 or Less classification for Permit Fees is based on the cost of the entire project including all phases and bid packages. If total of bids received for all phases and bid packages exceeds \$750,000.00 for a fully locally-funded public K-12 project, then a Permit Fee is owed.

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

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

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

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

License No.: _____ Classification(s): _____
Bid Limit: _____

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

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

(15)

APPROVAL	CONTRACTING PARTIES
<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>ALABAMA STATE DEPARTMENT OF EDUCATION (SDE) <i>(Required for locally-funded, SDE projects.)</i></p> <p>By _____ Date: _____ State Superintendent of Education</p> </div>	<div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <p style="text-align: center;">_____ Contractor Company</p> <p>By _____ Signature</p> <p>Name & Title _____</p> </div> <div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">_____ Owner Entity</p> <p>By _____ Signature</p> <p>Name(s) & Title(s) _____</p> </div>

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



Kay Ivey
Governor

Bill Poole
Director of Finance

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

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



Mickey Allen
Assistant Finance Director
Real Property Management

Frank Barnes, Director
Construction Management

E-Verify Memorandum of Understanding

Instructions for inclusion in project manuals.

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

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

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



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.

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

(1) **PERFORMANCE BOND**

SURETY'S BOND NUMBER

Do not staple this form; use clips.

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

Name:
Address:

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

Name:
Address:

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

Name:
Address:

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

Dollars (\$) _____).

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

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

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

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

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

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

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

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

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

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

(9 & 10) **SURETY:**

CONTRACTOR as PRINCIPAL:

Company Name

Company Name

By _____
Signature

By _____
Signature

Name and Title

Name and Title

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

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

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

(1) **PAYMENT BOND**

SURETY'S BOND NUMBER

Do not staple this form; use clips.

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

Name:

Address:

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

Name:

Address:

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

Name:

Address:

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

Dollars (\$) _____).

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

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

1. **WE, THE PRINCIPAL (hereinafter "Contractor") AND THE SURETY**, jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the Owner in the Penal Sum stated above to promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract, which is incorporated herein by reference, and any modifications thereof by Contract Change Orders. If the Contractor and its Subcontractors promptly pay all persons supplying labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders, then this obligation shall be null and void; otherwise to remain and be in full force and effect.
2. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

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

- 3. Any person that has furnished labor, materials, or supplies for or in the prosecution of the Contract and Contract Change Orders for which payment has not been timely made may institute a civil action upon this Bond and have their rights and claims adjudicated in a civil action and judgment entered thereon. Notwithstanding the foregoing, a civil action may not be instituted on this bond until 45 days after written notice to the Surety of the amount claimed to be due and the nature of the claim. The civil action must commence not later than one year from the date of final settlement of the Contract. The giving of notice by registered or certified mail, postage prepaid, addressed to the Surety at any of its places of business or offices shall be deemed sufficient. In the event the Surety or Contractor fails to pay the claim in full within 45 days from the mailing of the notice, then the person or persons may recover from the Contractor and Surety, in addition to the amount of the claim, a reasonable attorney's fee based on the result, together with interest on the claim from the date of the notice.
- 4. Every person having a right of action on this bond shall, upon written application to the Owner indicating that labor, material, or supplies for the Work have been supplied and that payment has not been made, be promptly furnished a certified copy of this bond and the Construction Contract. The claimant may bring a civil action in the claimant's name on this Bond against the Contractor and the Surety, or either of them, in the county in which the Work is to be or has been performed or in any other county where venue is otherwise allowed by law.
- 5. This bond is furnished to comply with Code of Alabama, §39-1-1, and all provisions thereof shall be applicable to civil actions upon this bond.
- 6. All claims and disputes between Owner and either the Contractor or Surety arising out of or related to this bond, or its breach, shall be resolved in accordance with Article 24, General Conditions of the Contract.

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

(9 & 10) **SURETY:**

CONTRACTOR as PRINCIPAL:

Company Name

Company Name

By _____
Signature

By _____
Signature

Name and Title

Name and Title

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

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

GENERAL CONDITIONS of the CONTRACT

CONTENTS

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

- C. COMMISSION:** The former Alabama Building Commission, for which the Alabama Division of Construction Management has been designated by the Legislature as its successor.
- D. CONTRACT:** The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:
- (1) Construction Contract
 - (2) Performance and Payment Bonds
 - (3) Conditions of the Contract (General, Supplemental, and other Conditions)
 - (4) Specifications
 - (5) Drawings
 - (6) Contract Change Orders
 - (7) Modifications to the Construction Contract (applicable to PSCA Projects)
- E. CONTRACT SUM:** The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term “Contract Sum” means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.
- F. CONTRACT TIME:** The Contract Time is the period of time in which the Contractor must achieve Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner or Director. The Date of Substantial Completion is the date established in accordance with Article 32. The term “Contract Time” means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.
- G. CONTRACTOR:** The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity, identified as such in the Construction Contract. The term “Contractor” means the Contractor or the Contractor’s authorized representative.
- H. DCM:** The Alabama Division of Construction Management.
- I. DCM PROJECT INSPECTOR:** The member of the Technical Staff of the Alabama Division of Construction Management to whom the Project is assigned relative to executing the respective inspections and authorities described in Article 16, Inspection of the Work.
- J. DEFECTIVE WORK:** The term “Defective Work” shall apply to: (1) any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, (2) in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, (3) substitutions and deviations not properly submitted and approved or otherwise authorized, (4) temporary

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

- K. DIRECTOR:** The Director of the Alabama Division of Construction Management.
- L. DRAWINGS:** The Drawings are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.
- M. NOTICE TO PROCEED:** A proceed order issued by the Owner or Director, as applicable, fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.
- N.1 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”.
- N.2 AWARDING AUTHORITY:** §39-2-1 (1) of the Code of Alabama, 1975, as amended definition: Any governmental board, commission, agency, body, authority, instrumentality, department, or subdivision of the state, its counties and municipalities. This term includes, but shall not be limited to, the Department of Transportation, the Division of Real Property Management of the Department of Finance, the State Board of Education, and any other entity contracting for public works. This term shall exclude the State Docks Department and any entity exempted from the competitive bid laws of the state by statute.
- O. THE PROJECT:** The Project is the total construction of which the Work required by these Contract Documents may be the entirety or only a part with other portions to be constructed by the Owner or separate contractors.
- P. PROJECT MANUAL:** The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.
- Q. SPECIFICATIONS:** The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.
- R. SUBCONTRACTOR:** A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term “Subcontractor” means a Subcontractor or its authorized representatives.
- S. THE WORK:** The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor’s obligations under the Contract. The Work may constitute the entire Project or only a portion of it.

ARTICLE 2
INTENT and INTERPRETATION of the CONTRACT DOCUMENTS

A. INTENT

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

B. COMPLEMENTARY DOCUMENTS

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

C. ORDER of PRECEDENCE

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

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

D. ORGANIZATION

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

E. INTERPRETATION

(1) The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the Intent of the Contract Documents stated in preceding Paragraph A. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as “Not In Contract” (“N.I.C.”), the Contractor’s obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor’s expense to produce a product or system that is complete, appropriately tested, and in operative condition ready for use or subsequent construction or operation of the Owner or separate contractors. The omission of words or phases

for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

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

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

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

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

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

F. SEVERABILITY.

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

**ARTICLE 3
CONTRACTOR'S REPRESENTATIONS**

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

- A. The Contractor has visited the site of the Work to become familiar with local conditions under which the Work is to be performed and to evaluate reasonably observable conditions as compared with requirements of the Contract Documents.
- B. The Contractor shall use its best skill and attention to perform the Work in an expeditious manner consistent with the Contract Documents.
- C. The Contractor is an independent contractor and in performance of the Contract remains and shall act as an independent contractor having no authority to represent or obligate the Owner in any manner unless authorized by the Owner in writing.

**ARTICLE 4
DOCUMENTS FURNISHED to CONTRACTOR**

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

ARTICLE 5
OWNERSHIP of DRAWINGS

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

ARTICLE 6
SUPERVISION, SUPERINTENDENT, and EMPLOYEES

A. SUPERVISION and CONSTRUCTION METHODS

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

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

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

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

B. SUPERINTENDENT

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

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

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

C. EMPLOYEES

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

ARTICLE 7

REVIEW of CONTRACT DOCUMENTS and FIELD CONDITIONS by CONTRACTOR

- A. In order to facilitate assembly and installation of the Work in accordance with the Contract Documents, before starting each portion of the Work, the Contractor shall examine and compare the relevant Contract Documents, and compare them to relevant field measurements made by the Contractor and any conditions at the site affecting that portion of the Work.
- B. If the Contractor discovers any errors, omissions, or inconsistencies in the Contract Documents, the Contractor shall promptly report them to the Architect as a written request for information that includes a detailed statement identifying the specific Drawings or Specifications that are in need of clarification and the error, omission, or inconsistency discovered in them.
- (1) The Contractor shall not be expected to act as a licensed design professional and ascertain whether the Contract Documents comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, but the Contractor shall be obligated to promptly notify the Architect of any such noncompliance discovered by or made known to the Contractor. If the Contractor performs Work without fulfilling this notification obligation, the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.
- (2) The Contractor shall not be liable to the Owner for errors, omissions, or inconsistencies that may exist in the Contract Documents, or between the Contract Documents and conditions at the site, unless the Contractor knowingly fails to report a discovered error, omission, or inconsistency to the Architect, in which case the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.
- C. If the Contractor considers the Architect's response to a request for information to constitute a change to the Contract Documents involving additional costs and/or time, the Contractor shall follow the procedures of Article 20, Claims for Extra Cost or Extra Work.
- D. If, with undue frequency, the Contractor requests information that is obtainable through reasonable examination and comparison of the Contract Documents, site conditions, and previous correspondence, interpretations, or clarifications, the Contractor shall be liable to the Owner for reasonable charges from the Architect for the additional services required to review, research, and respond to such requests for information.

ARTICLE 8
SURVEYS by CONTRACTOR

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

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

ARTICLE 9
SUBMITTALS

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

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

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

- D. By approving a Submittal the Contractor represents not only that the element of Work presented in the Submittal complies with the requirements of the Contract Documents, but also that the Contractor has:
 - (1) found the layout and/or dimensions in the Submittal to be comparable with those in the Contract Documents and other relevant Submittals and has made field measurements as necessary to verify their accuracy, and
 - (2) determined that products, materials, systems, equipment and/or procedures presented in the Submittal are compatible with those presented, or being presented, in other relevant Submittals and

with the Contractor's intended Construction Methods.

- E. The Contractor shall not fabricate or perform any portion of the Work for which the Contract Documents require Submittals until the respective Submittals have been approved by the Architect.
- F. In the case of a resubmission, the Contractor shall direct specific attention to all revisions in a Submittal. The Architect's approval of a resubmission shall not apply to any revisions that were not brought to the Architect's attention.
- G. If the Contract Documents specify that a Submittal is to be prepared and sealed by a registered architect or licensed engineer retained by the Contractor, all drawings, calculations, specifications, and certifications of the Submittal shall bear the Alabama seal of registration and signature of the registered/licensed design professional who prepared them or under whose supervision they were prepared. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of such a Submittal, provided that all performance and design criteria that such Submittal must satisfy are sufficiently specified in the Contract Documents. The Architect will review, approve or take other appropriate action on such a Submittal only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria specified in the Contract Documents.

H. DEVIATIONS

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

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

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

I. ARCHITECT'S REVIEW and APPROVAL

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

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

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

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

J. CONFORMANCE with SUBMITTALS

The Work shall be constructed in accordance with approved Submittals.

ARTICLE 10
DOCUMENTS and SAMPLES at the SITE

A. "AS ISSUED" SET

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

B. "POSTED" SET

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

C. RECORD SET

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

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

ARTICLE 11
“AS-BUILT” DOCUMENTS

- A. Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets of “As-built” documents, as described herein, to the Architect for submission to the Owner upon completion of the Work. Each set of “As-built” documents shall consist of a copy of the Drawings and Project Manual, in like-new condition, into which the Contractor has neatly incorporated all Addenda, Change Orders, supplemental drawings, clarifications, field changes, corrections, selections, actual locations of underground utilities, and other information as required herein or specified elsewhere in the Contract Documents.
- B. The Contractor shall use the following methods for incorporating information into the “As-built” documents:
- (1) **Drawings**
- (a) To the greatest extent practicable, information shall be carefully drawn and lettered, in ink, on the Drawings in the form of sketches, details, plans, notes, and dimensions as required to provide a fully dimensioned record of the Work. When required for clarity, sketches, details, or partial plans shall be drawn on supplemental sheets and bound into the Drawings and referenced on the drawing being revised.
- (b) Where a revised drawing has been furnished by the Architect, the drawing of latest date shall be bound into the Drawings in the place of the superseded drawing.
- (c) Where a supplemental drawing has been furnished by the Architect, the supplemental drawing shall be bound into the Drawings in an appropriate location and referred to by notes added to the drawing being supplemented.
- (d) Where the Architect has furnished details, partial plans, or lengthy notes of which it would be impractical for the Contractor to redraw or letter on a drawing, such information may be affixed to the appropriate drawing with transparent tape if space is available on the drawing.
- (e) Any entry of information made in the Drawings that is the result of an Addendum or Change Order, shall identify the Addendum or Change Order from which it originated.
- (2) **Project Manual**
- (a) A copy of all Addenda and Change Orders, excluding drawings thereof, shall be bound in the front of the Project Manual.
- (b) Where a document, form, or entire specification section is revised, the latest issue shall be bound into the Project Manual in the place of the superseded issue.
- (c) Where information within a specification section is revised, the deleted or revised information shall be drawn through in ink and an adjacent note added identifying the Addendum or Change Order containing the revised information.
- C. Within ten days after the Date of Substantial Completion of the Work, or the last completed portion of the Work, the Contractor shall submit the “As-built” documents to the Architect for approval. If the Architect requires that any corrections be made, the documents will be returned in a reasonable time for correction and resubmission.

ARTICLE 12
PROGRESS SCHEDULE

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

- A. The Contractor shall within fifteen days after the date of commencement stated in the Notice to Proceed, or such other time as may be provided in the Contract Documents, prepare and submit to the Architect for review and approval a practicable construction schedule informing the Architect and Owner of the order in which the Contractor plans to carry on the Work within the Contract Time. The Architect's review and approval of the Contractor's construction schedule shall be only for compliance with the specified format, Contract Time, and suitability for monitoring progress of the Work and shall not be construed as a representation that the Architect has analyzed the schedule to form opinions of sequences or durations of time represented in the schedule.
- B. If a schedule format is not specified elsewhere in the Contract Documents, the construction schedule shall be prepared using DCM Form C-11, "Sample Progress Schedule and Report", (contained in the Project Manual) or similar format of suitable scale and detail to indicate the percentage of Work scheduled to be completed at the end of each month. At the end of each month the Contractor shall enter the actual percentage of completion on the construction schedule submit two copies to the Architect, and attach one copy to each copy of the monthly Application for Payment. The construction schedule shall be revised to reflect any agreed extensions of the Contract Time or as required by conditions of the Work.
- C. If a more comprehensive schedule format is specified elsewhere in the Contract Documents or voluntarily employed by the Contractor, it may be used in lieu of DCM Form C-11.
- D. The Contractor's construction schedule shall be used by the Contractor, Architect, and Owner to determine the adequacy of the Contractor's progress. The Contractor shall be responsible for maintaining progress in accordance with the currently approved construction schedule and shall increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant and equipment as may be necessary to do so. If the Contractor's progress falls materially behind the currently approved construction schedule and, in the opinion of the Architect or Owner, the Contractor is not taking sufficient steps to regain schedule, the Architect may, with the Owner's concurrence, issue the Contractor a Notice to Cure pursuant to Article 27. In such a Notice to Cure the Architect may require the Contractor to submit such supplementary or revised construction schedules as may be deemed necessary to demonstrate the manner in which schedule will be regained.

ARTICLE 13
EQUIPMENT, MATERIALS, and SUBSTITUTIONS

- A. Every part of the Work shall be executed in a workmanlike manner in accordance with the Contract Documents and approved Submittals. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise.
- B. Whenever a product, material, system, item of equipment, or service is identified in the Contract Documents by reference to a trade name, manufacturer's name, model number, etc.(hereinafter

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

- C. If the Contract Documents identify three or more sources for a product, material, system, item of equipment or service to be used and the list of sources is not followed by “or approved equal” or similar wording, the Contractor may make substitution only after evaluation by the Architect and execution of an appropriate Contract Change Order.
- D. If the Contract Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the Contractor must furnish the identified sole source.

ARTICLE 14 **SAFETY and PROTECTION of PERSONS and PROPERTY**

- A. The Contractor shall be solely and completely responsible for conditions at the Project site, including safety of all persons (including employees) and property. The Contractor shall create, maintain, and supervise conditions and programs to facilitate and promote safe execution of the Work, and shall supervise the Work with the attention and skill required to assure its safe performance. Safety provisions shall conform to OSHA requirements and all other federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. Nothing contained in this Contract shall be construed to mean that the Owner has employed the Architect nor has the Architect employed its consultants to administer, supervise, inspect, or take action regarding safety programs or conditions at the Project site.
- B. The Contractor shall employ Construction Methods, safety precautions, and protective measures that will reasonably prevent damage, injury or loss to:
 - (1) workers and other persons on the Project site and in adjacent and other areas that may be affected by the Contractor’s operations;
 - (2) the Work and materials and equipment to be incorporated into the Work and stored by the Contractor on or off the Project site; and
 - (3) other property on, or adjacent to, the Project site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and other improvements not designated in the Contract Documents to be removed, relocated, or replaced.
- C. The Contractor shall be responsible for the prompt remedy of damage and loss to property, including the filing of appropriate insurance claims, caused in whole or in part by the fault or negligence of the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

- D. The Contractor shall comply with and give notices required by applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety and protection of persons or property, including without limitation notices to adjoining property owners of excavation or other construction activities that potentially could cause damage or injury to adjoining property or persons thereon.
- E. The Contractor shall erect and maintain barriers, danger signs, and any other reasonable safeguards and warnings against hazards as may be required for safety and protection during performance of the Contract and shall notify owners and users of adjacent sites and utilities of conditions that may exist or arise which may jeopardize their safety.
- F. If use or storage of explosives or other hazardous materials or equipment or unusual Construction Methods are necessary for execution of the Work, the Contractor shall exercise commensurate care and employ supervisors and workers properly qualified to perform such activity.
- G. The Contractor shall furnish a qualified safety representative at the Project site whose duties shall include the prevention of accidents. The safety representative shall be the Contractor's superintendent, unless the Contractor assigns this duty to another responsible member of its on-site staff and notifies the Owner and Architect in writing of such assignment.
- H. The Contractor shall not permit a load to be applied, or forces introduced, to any part of the construction or site that may cause damage to the construction or site or endanger safety of the construction, site, or persons on or near the site.
- I. The Contractor shall have the right to act as it deems appropriate in emergency situations jeopardizing life or property. The Contractor shall be entitled to equitable adjustment of the Contract Sum or Contract Time for its efforts expended for the sole benefit of the Owner in an emergency. Such adjustment shall be determined as provided in Articles 19 and 20.
- J. The duty of the Architect and the Architect's consultants to visit the Project site to conduct periodic inspections of the Work or for other purposes shall not give rise to a duty to review or approve the adequacy of the Contractor's safety program, safety supervisor, or any safety measure which Contractor takes or fails to take in, on, or near the Project site.

ARTICLE 15
HAZARDOUS MATERIALS

- A. A Hazardous Material is any substance or material identified as hazardous under any federal, state, or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing its handling, disposal, and/or clean-up. Existing Hazardous Materials are Hazardous Materials discovered at the Project site and not introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable.
- B. If, during the performance of the Work, the Contractor encounters a suspected Existing Hazardous Material, the Contractor shall immediately stop work in the affected area, take measures appropriate to the condition to keep people away from the suspected Existing Hazardous Material, and

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

- C. The Owner shall obtain the services of an independent laboratory or professional consultant, appropriately licensed and qualified, to determine whether the suspected material is a Hazardous Material requiring abatement and, if so, to certify after its abatement that it has been rendered harmless. Any abatement of Existing Hazardous Materials will be the responsibility of the Owner. The Owner will advise the Contractor in writing of the persons or entities who will determine the nature of the suspected material and those who will, if necessary, perform the abatement. The Owner will not employ persons or entities to perform these services to whom the Contractor or Architect has reasonable objection.
- D. After certification by the Owner's independent laboratory or professional consultant that the material is harmless or has been rendered harmless, work in the affected area shall resume upon written agreement between the Owner and Contractor. If the material is found to be an Existing Hazardous Material and the Contractor incurs additional cost or delay due to the presence and abatement of the material, the Contract Sum and/or Contract Time shall be appropriately adjusted by a Contract Change Order pursuant to Article 19.
- E. The Owner shall not be responsible for Hazardous Materials introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable unless such Hazardous Materials were required by the Contract Documents.

ARTICLE 16 **INSPECTION of the WORK**

A. GENERAL

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

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

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

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

B. TYPES of INSPECTIONS

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

(a) **Pre-construction Conference.**

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

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

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

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

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

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

C. INSPECTIONS by the ARCHITECT

- (1) The Architect is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents (other than “minor” deviations as defined in Article 9 and “minor” changes as defined in Article 19), to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner.
- (2) The Architect will visit the site at intervals appropriate to the stage of the Contractor’s operations and as otherwise necessary to:
 - (a) become generally familiar with the in-progress and completed Work and the quality of the Work,
 - (b) determine whether the Work is progressing in general accordance with the Contractor’s schedule and is likely to be completed within the Contract Time,
 - (c) visually compare readily accessible elements of the Work to the requirements of the Contract Documents to determine, in general, if the Contractor’s performance of the Work indicates that the Work will conform to the requirements of the Contract Documents when completed,
 - (d) endeavor to guard the Owner against Defective Work,
 - (e) review and address with the Contractor any problems in implementing the requirements of the Contract Documents that the Contractor may have encountered, and
 - (f) keep the Owner fully informed about the Project.
- (3) The Architect shall have the authority to reject Defective Work or require its correction, but shall not be required to make exhaustive investigations or examinations of the in-progress or completed portions of the Work to expose the presence of Defective Work. However, it shall be an obligation of the Architect to report in writing, to the Owner, Contractor, and DCM Project Inspector, any Defective Work recognized by the Architect.
- (4) The Architect shall have the authority to require the Contractor to stop work only when, in the Architect’s reasonable opinion, such stoppage is necessary to avoid Defective Work. The Architect shall not be liable to the Contractor or Owner for the consequences of any decisions made by the Architect in good faith either to exercise or not to exercise this authority.
- (5) “Inspections by the Architect” includes appropriate inspections by the Architect’s consultants as dictated by their respective disciplines of design and the stage of the Contractor’s operations.

D. INSPECTIONS by the DCM PROJECT INSPECTOR

- (1) The DCM Project Inspector will:
 - (a) participate in scheduled inspections and conferences as practicable,
 - (b) perform periodic inspections of in-progress and completed Work to ensure code compliance of the Project and general conformance of the Work with the Contract Documents, and
 - (c) monitor the Contractor's progress and performance of the Work.
- (2) The DCM Project Inspector shall have the authority to:
 - (a) reject Work that is not in compliance with the State Building Code adopted by the DCM, unless the Work is in accordance with the Contract Documents in which case the DCM Project Inspector will advise the Architect to initiate appropriate corrective action, and
 - (b) notify the Architect, Owner, and Contractor of Defective Work recognized by the DCM Project Inspector.

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

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

E. UNCOVERING WORK

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

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

F. SPECIFIED INSPECTIONS and TESTS

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

(2) If the Architect, Owner, or public authority having jurisdiction determines that inspections, tests, demonstrations, or approvals in addition to Specified Inspections and Tests are required, the Contractor shall, upon written instruction from the Architect, arrange for their performance by an entity acceptable to the Owner, giving timely notice to the architect of the time and place of their performance. Related costs shall be borne by the Owner unless the procedures reveal that Work is not in compliance with requirements of the Contract Documents, in which case the Contractor shall

bear the costs of correction, repeating the procedures, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services.

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

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

ARTICLE 17 **CORRECTION of DEFECTIVE WORK**

- A. The Contractor shall, at the Contractor's expense, promptly correct Defective Work rejected by the Architect or which otherwise becomes known to the Contractor, removing the rejected or nonconforming materials and construction from the project site.
- B. Correction of Defective Work shall be performed in such a timely manner as will avoid delay of completion, use, or occupancy of the Work and the work of the Owner and separate contractors.
- C. The Contractor shall bear all expenses related to the correction of Defective Work, including but not limited to: (1) additional testing and inspections, including repeating Specified Inspections and Tests, (2) reasonable services and expenses of the Architect, and (3) the expense of making good all work of the Contractor, Owner, or separate contractors destroyed or damaged by the correction of Defective Work.

ARTICLE 18 **DEDUCTIONS for UNCORRECTED WORK**

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

ARTICLE 19 **CHANGES in the WORK**

A. GENERAL

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

- (2) If the Owner directs a change in the Work, the change shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract, stating their agreement upon the change or changes in the Work and the adjustments, if any, in the Contract Sum and the Contract Time.
- (3) Subject to compliance with Alabama's Public Works Law, the Owner may, upon agreement by the Contractor, incorporate previously unawarded bid alternates into the Contract.
- (4) In the event of a claim or dispute as to the appropriate adjustment to the Contract Sum or Contract Time due to a directive to make changes in the Work, the Work shall proceed as provided in this article subject to subsequent agreement of the parties or final resolution of the dispute pursuant to Article 24.
- (5) Consent of surety will be obtained for all Contract Change Orders involving an increase in the Contract Sum.
- (6) Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly to perform changes in the Work, unless otherwise directed by the Owner through the Architect.
- (7) All change orders require DCM Form C-12: Contract Change Order and DCM Form B-11: Change Order Justification. Only Change Orders 10% or greater of the current contract amount require the Owner's legal advisor's signature on DCM Form B-11: Change Order Justification.

B. DETERMINATION of ADJUSTMENT of the CONTRACT SUM

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

- (1) **Lump Sum.** By mutual agreement to a lump sum based on or negotiated from an itemized cost proposal from the Contractor. Additions to the Contract Sum shall include the Contractor's direct costs plus a maximum 15% markup for overhead and profit. Where subcontract work is involved the total mark-up for the Contractor and a Subcontractor shall not exceed 25%. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.
- (2) **Unit Price.** By application of Unit Prices included in the Contract or subsequently agreed to by the parties. However, if the character or quantity originally contemplated is materially changed so that application of such unit price to quantities of Work proposed will cause substantial inequity to either party, the applicable unit price shall be equitably adjusted.
- (3) **Force Account.** By directing the Contractor to proceed with the change in the Work on a "force account" basis under which the Contractor shall be reimbursed for reasonable expenditures incurred by the Contractor and its Subcontractors in performing added Work and the Owner shall receive reasonable credit for any deleted Work. The Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting of the cost of the change together with

sufficient supporting data. Unless otherwise stated in the directive, the adjustment of the Contract Sum shall be limited to the following:

- (a) costs of labor and supervision, including employee benefits, social security, retirement, unemployment and workers' compensation insurance required by law, agreement, or under Contractor's or Subcontractor's standard personnel policy;
- (b) cost of materials, supplies and equipment, including cost of delivery, whether incorporated or consumed;
- (c) rental cost of machinery and equipment, not to exceed prevailing local rates if contractor-owned;
- (d) costs of premiums for insurance required by the Contract Documents, permit fees, and sales, use or similar taxes related to the change in the Work;
- (e) reasonable credits to the Owner for the value of deleted Work, without Contractor or Subcontractor mark-ups; and
- (f) for additions to the Contract Sum, mark-up of the Contractor's direct costs for overhead and profit not exceeding 15% on Contractor's work nor exceeding 25% for Contractor and Subcontractor on a Subcontractor's work. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of insurance other than mentioned above, bonds, superintendent and other job office personnel, watchman, use and rental of small tools, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

C. ADJUSTMENT of the CONTRACT TIME due to CHANGES

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

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

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

D. CHANGE ORDER PROCEDURES

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

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

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

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

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

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

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

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

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

ARTICLE 20

CLAIMS for EXTRA COST or EXTRA WORK

- A. If the Contractor considers any instructions by the Architect, Owner, DCM Project Inspector, or public authority having jurisdiction to be contrary to the requirements of the Contract Documents and will involve extra work and/or cost under the Contract, the Contractor shall give the Architect written notice thereof within ten days after receipt of such instructions, and in any event before proceeding to execute such work. As used in this Article, "instructions" shall include written or

oral clarifications, directions, instructions, interpretations, or determinations.

- B. The Contractor's notification pursuant to Paragraph 20.A shall state: (1) the date, circumstances, and source of the instructions, (2) that the Contractor considers the instructions to constitute a change to the Contract Documents and why, and (3) an estimate of extra cost and time that may be involved to the extent an estimate may be reasonably made at that time.
- C. Except for claims relating to an emergency endangering life or property, no claim for extra cost or extra work shall be considered in the absence of prior notice required under Paragraph 20.A.
- D. Within ten days of receipt of a notice pursuant to Paragraph 20.A, the Architect will respond in writing to the Contractor, stating one of the following:
 - (1) The cited instruction is rescinded.
 - (2) The cited instruction is a change in the Work and in which manner the Contractor is to proceed with procedures of Article 19, Changes in the Work.
 - (3) The cited instruction is reconfirmed, is not considered by the Architect to be a change in the Contract Documents, and the Contractor is to proceed with Work as instructed.
- E. If the Architect's response to the Contractor is as in Paragraph 20.D(3), the Contractor shall proceed with the Work as instructed. If the Contractor continues to consider the instructions to constitute a change in the Contract Documents, the Contractor shall, within ten days after receiving the Architect's response, notify the Architect in writing that the Contractor intends to submit a claim pursuant to Article 24, Resolution of Claims and Disputes

ARTICLE 21

DIFFERING SITE CONDITIONS

A. DEFINITION

“Differing Site Conditions” are:

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

B. PROCEDURES

If Differing Site Conditions are encountered, then the party discovering the condition shall promptly notify the other party before the condition is disturbed and in no event later than ten days after discovering the condition. Upon such notice and verification that a Differing Site Condition exists, the Architect will, with reasonable promptness and with the Owner's concurrence, make changes in the Drawings and/or Specifications as are deemed necessary to conform to the Differing Site Condition. Any increase or decrease in the Contract Sum or Contract Time that is warranted by the changes will be made as provided under Article 19, Changes in the Work. If the Architect determines a Differing Site Condition has not been encountered, the Architect shall notify the

Owner and Contractor in writing, stating the reason for that determination.

ARTICLE 22
CLAIMS for DAMAGES

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time after the discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

ARTICLE 23
DELAYS

- A. A delay beyond the Contractor's control at any time in the commencement or progress of Work by an act or omission of the Owner, Architect, or any separate contractor or by labor disputes, unusual delay in deliveries, unavoidable casualties, fires, abnormal floods, tornadoes, or other cataclysmic events of nature, may entitle the Contractor to an extension of the Contract Time provided, however, that the Contractor shall, within ten days after the delay first occurs, give written notice to the Architect of the cause of the delay and its probable effect on progress of the entire Work.
- B. Adverse weather conditions that are more severe than anticipated for the locality of the Work during any given month may entitle the Contractor to an extension of Contract Time provided, however;
- (1) the weather conditions had an adverse effect on construction scheduled to be performed during the period in which the adverse weather occurred, which in reasonable sequence would have an effect on completion of the entire Work,
 - (2) the Contractor shall, within twenty-one days after the end of the month in which the delay occurs, give the Architect written notice of the delay that occurred during that month and its probable effect on progress of the Work, and
 - (3) within a reasonable time after giving notice of the delay, the Contractor provides the Architect with sufficient data to document that the weather conditions experienced were unusually severe for the locality of the Work during the month in question. Unless otherwise provided in the Contract Documents, data documenting unusually severe weather conditions shall compare actual weather conditions to the average weather conditions for the month in question during the previous five years as recorded by the National Oceanic and Atmospheric Administration (NOAA) or similar record-keeping entities.
- C. Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.

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

ARTICLE 24
RESOLUTION of CLAIMS and DISPUTES

A. APPLICABILITY of ARTICLE

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

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

B. CONTINUANCE of PERFORMANCE

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

C. GOOD FAITH EFFORT to SETTLE

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

D. FINAL RESOLUTION for STATE-FUNDED CONTRACTS

(1) If the Contract is funded in whole or in part with state funds, the final Resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner shall be by the Director, whose decision shall be final, binding, and conclusive upon the Contractor, its Surety, and the Owner.

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

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

E. FINAL RESOLUTION for LOCALLY-FUNDED CONTRACTS

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

ARTICLE 25
OWNER'S RIGHT to CORRECT DEFECTIVE WORK

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

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

A. STOPPING the WORK for CAUSE

If the Contractor fails to correct Defective Work or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work, or any part of the Work, until the cause for the Owner's directive has been eliminated; however, the Owner's right to stop the Work shall not be construed as a duty of the Owner to be exercised for the benefit of the Contractor or any other person or entity.

B. SUSPENSION by the OWNER for CONVENIENCE

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

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

ARTICLE 27
OWNER'S RIGHT to TERMINATE CONTRACT

A. TERMINATION by the OWNER for CAUSE

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

- (a) should be adjudged bankrupt, or should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency to the extent termination for these reasons is permissible under applicable law;
- (b) refuses or fails to prosecute the Work, or any part of the Work, with the diligence that will insure its completion within the Contract Time, including any extensions, or fails to complete the Work within the Contract Time;
- (c) refuses or fails to perform the Work, including prompt correction of Defective Work, in a manner that will insure that the Work, when fully completed, will be in accordance with the Contract Documents;
- (d) fails to pay for labor or materials supplied for the Work or to pay Subcontractors in accordance with the respective Subcontract;
- (e) persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction, or the instructions of the Architect or Owner; or
- (f) is otherwise guilty of a substantial breach of the Contract.

(2) **Procedure for Unbonded Construction Contracts (Generally, contracts less than \$100,000):**

- (a) **Notice to Cure:** In the presence of any of the above conditions the Architect may give the Contractor written notice to cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.
- (b) **Notice of Termination:** If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor written notice that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.
- (c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a seven day Notice of Termination

without giving the Contractor another Notice to Cure.

- (d) At the expiration of the seven days of the termination notice, the Owner may:
 - .1 take possession of the site, of all materials and equipment stored on and off site, and of all Contractor-owned tools, construction equipment and machinery, and facilities located at the site, and
 - .2 finish the Work by whatever reasonable method the Owner may deem expedient.
- (e) The Contractor shall not be entitled to receive further payment under the Contract until the Work is completed.
- (f) If the Owner's cost of completing the Work, including correction of Defective Work, compensation for additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees due to the default and termination, is less than the unpaid balance of the Contract Sum, the excess balance less liquidated damages for delay shall be paid to the Contractor. If such cost to the Owner including attorney's fees, plus liquidated damages, exceeds the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner. Final Resolution of any claim or Dispute involving the termination or any amount due any party as a result of the termination shall be pursuant to Article 24.
- (g) Upon the Contractor's request, the Owner shall furnish to the Contractor a detailed accounting of the Owner's cost of completing the Work.

(3) Procedure for Bonded Construction Contracts (Generally, contracts of \$100,000 or more):

- (a) **Notice to Cure:** In the presence of any of the above conditions the Architect may give the Contractor and its Surety written Notice to Cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.
- (b) **Notice of Termination:** If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor and its Surety written notice declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.
- (c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a Notice of Termination without giving the Contractor another Notice to Cure.
- (d) **Demand on the Performance Bond:** With the Notice of Termination the Owner shall give the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation to take charge of and complete the Work in accordance with the terms of the Performance Bond.
- (e) **Surety Claims:** Upon receiving the Owner's demand on the Performance Bond, the Surety shall assume all rights and obligations of the Contractor under the Contract. However, the Surety shall also have the right to assert "Surety Claims" to the Owner, which are defined as claims relating to acts or omissions of the Owner or Architect prior to termination of the Contractor which may have prejudiced its rights as Surety or its interest in the unpaid balance of the Contract Sum. If the Surety wishes to assert a Surety Claim, it shall give the Owner, through the Architect, written notice within twenty-one days after first recognizing the condition giving rise to the Surety Claim. The Surety Claim shall then be submitted to the Owner, through the Architect, no later than sixty days after giving notice thereof, but no such Surety Claims shall be considered if submitted after the date upon which final payment

becomes due. Final resolution of Surety Claims shall be pursuant to Article 24, Resolution of Claims and Disputes. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

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

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

B. TERMINATION by the OWNER for CONVENIENCE

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

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

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

(3) In the event of Termination for Convenience, the Contractor shall be entitled to receive payment for the Work performed prior to its termination, including materials and equipment purchased and delivered for incorporation into the terminated Work, and any reasonable costs incurred because of the termination. Such payment shall include reasonable mark-up of costs for overhead and profit, not to exceed the limits stated in Article 19, Changes in the Work. The Contractor shall be entitled to receive payment for reasonable anticipated overhead ("home office") and shall not be entitled to receive payment for any profits anticipated to have been gained from the terminated Work. A proposal for decreasing the Contract Sum shall be submitted to the Architect by the Contractor in such time and detail, and with such supporting documentation, as is reasonably directed by the Owner. Final modification of the Contract shall be by Contract Change Order pursuant to Article 19. Any Claim or Dispute involving the termination or any amount due a party as a result shall be resolved pursuant to Article 24.

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

A. SUSPENSION by the OWNER

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

B. NONPAYMENT

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

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

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

ARTICLE 29
PROGRESS PAYMENTS

A. FREQUENCY of PROGRESS PAYMENTS

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

B. SCHEDULE of VALUES

Within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a DCM Form C-10SOV, Schedule of Values, which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall be printable on 8.5" × 11" and shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to

Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

C. APPLICATIONS for PAYMENTS

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

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

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

(4) The Applications for Payment of State Agency/Authority projects and Public School and College Authority (PSCA)-funded projects must be activated via the appropriate DocuSign link available from DCM's Engage Portal at <https://engagealabama-rpm.facilityforce.cloud>.

D. MATERIALS STORED OFF SITE

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

- (1) the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location;
- (2) a Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party;
- (3) the Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate inspection and verification of the presence of the materials or equipment by the Architect or Owner;
- (4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner; and
- (5) compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest.

E. RETAINAGE

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

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

F. CONTRACTOR’S CERTIFICATION

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

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

G. PAYMENT ESTABLISHES OWNERSHIP

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

ARTICLE 30
CERTIFICATION and APPROVALS for PAYMENT

A. The Architect’s review, approval, and certification of Applications for Payment shall be based on the Architect’s general knowledge of the Work obtained through site visits and the information provided by the Contractor with the Application. The Architect shall not be required to perform exhaustive examinations, evaluations, or estimates of the cost of completed or uncompleted Work or stored materials to verify the accuracy of amounts requested by the Contractor, but the Architect shall have the authority to adjust the Contractor’s estimate when, in the Architect’s reasonable opinion, such estimates are overstated or understated.

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

ARTICLE 31
PAYMENTS WITHHELD

- A.** The Architect may nullify or revise a previously issued Certificate for Payment prior to Owner's payment thereunder to the extent as may be necessary in the Architect's opinion to protect the Owner from loss on account of any of the following causes not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:
- (1)** Defective Work;
 - (2)** filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;
 - (3)** the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;
 - (4)** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
 - (5)** damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;
 - (6)** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or
 - (7)** the Contractor's persistent failure to conform to the requirements of the Contract Documents.

- B. If the Owner deems it necessary to withhold payment pursuant to preceding Paragraph A, the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.
- C. The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.
 - (1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.
 - (2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.
- D. The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.
- E. The Owner shall have the right to withhold from payments due the Contractor under this Contract an amount equal to any amount which the Contractor owes the Owner under another contract.

ARTICLE 32

SUBSTANTIAL COMPLETION

- A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items). Substantial Completion of the Work, or a designated portion of the Work, is not achieved until so agreed in a Certificate of Substantial Completion signed by the Contractor, Architect, Owner, and Technical Staff of the Alabama Division of Construction Management.
- B. The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items remaining to be completed or corrected for Final Acceptance prior to final payment.
- C. Substantial Completion is achieved and a Final Inspection is appropriate only when a minimal number of punch list items exists and only a short period of time will be required to correct or complete them. Upon receipt of the Contractor's notice for a Final Inspection, the Architect will advise the Contractor in writing of any conditions of the Work which the Architect or Owner is

aware do not constitute Substantial Completion, otherwise, a Final Inspection will proceed within a reasonable time after the Contractor's notice is given. However, the Architect will not be required to prepare lengthy listings of punch list items; therefore, if the Final Inspection discloses that Substantial Completion has not been achieved, the Architect may discontinue or suspend the inspection until the Contractor does achieve Substantial Completion.

D. CERTIFICATE of SUBSTANTIAL COMPLETION

(1) When the Work or a designated portion of the Work is substantially complete, the Architect will prepare (via the appropriate DocuSign link available from DCM's Engage Portal at <https://engagealabama-rpm.facilityforce.cloud>) and sign a Certificate of Substantial Completion to be signed in order by the Contractor, Owner, and Alabama Division of Construction Management.

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

- (a) the Work, or designated portion of the Work, is accepted by the Architect, Owner, and Alabama Division of Construction Management as being ready for occupancy,
- (b) the Contractor's one-year and special warranties for the Work covered by the Certificate commence, unless stated otherwise in the Certificate (the one-year warranty for punch list items completed or corrected after the period allowed in the Certificate shall commence on the date of their Final Acceptance), and
- (c) Owner becomes responsible for building security, maintenance, utility services, and insurance, unless stated otherwise in the Certificate.

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

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

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

ARTICLE 33
OCCUPANCY or USE PRIOR to COMPLETION

A. UPON SUBSTANTIAL COMPLETION

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

B. BEFORE SUBSTANTIAL COMPLETION

- (1) The Owner shall not occupy or utilize any portion of the Work before Substantial Completion of that portion has been achieved.
- (2) The Owner may deliver furniture and equipment and store, or install it in place ready for occupancy and use, in any designated portion of the Work before it is substantially completed under the following conditions:
 - (a) The Owner's storage or installation of furniture and equipment will not unreasonably disrupt or interfere with the Contractor's completion of the designated portion of the Work.
 - (b) The Contractor consents to the Owner's planned action (such consent shall not be unreasonably withheld).
 - (c) The Owner shall be responsible for insurance coverage of the Owner's furniture and equipment, and the Contractor's liability shall not be increased.
 - (d) The Contractor, Architect, and Owner will jointly inspect and record the condition of the Work in the area before the Owner delivers and stores or installs furniture and equipment; the Owner will equitably compensate the Contractor for making any repairs to the Work that may subsequently be required due to the Owner's delivery and storage or installation of furniture and equipment.
 - (e) The Owner's delivery and storage or installation of furniture and equipment shall not be deemed an acceptance of any Work not completed in accordance with the requirements of the Contract Documents.

ARTICLE 34
FINAL PAYMENT

A. PREREQUISITES to FINAL PAYMENT

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

- (1) Full execution of a Certificate of Substantial Completion for the Work, or each designated portion of the Work.
- (2) Final Acceptance of the Work.
- (3) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements of the Contract Documents; such as delivery of "as-built" documents, operating and maintenance manuals, warranties, etc.
- (4) Delivery to the Owner of a final Application for Payment, prepared by the Contractor and approved and certified by the Architect. Architect prepares DCM Form B-13: Final Payment Checklist and forwards it to the Owner along with the final Application for Payment.
- (5) Completion of an Advertisement for Completion pursuant to Paragraph C below.
- (6) Delivery by the Contractor to the Owner through the Architect of DCM Form C-18: Contractor's Affidavit of Payment of Debts and Claims, and a Release of Claims, if any, and such other documents as may be required by Owner, satisfactory in form to the Owner pursuant to Paragraph D below.
- (7) Consent of Surety to Final Payment, if any, to Contractor. This Consent of Surety is required for projects which have Payment and Performance Bonds.

- (8) Delivery by the Contractor to the Architect and Owner of other documents, if any, required by the Contract Documents as prerequisites to Final Payment.
- (9) See Manual of Procedures Chapter 7, Section L.7 concerning reconciliation of contract time, if any.

B. FINAL ACCEPTANCE of the WORK

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

C. ADVERTISEMENT for COMPLETION

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

(2) **If the Contract Sum is \$100,000 or more:** The Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion, similar to the sample contained in the Project Manual, published for a period of three weeks. The contractor can publish a notice in one or more of the following ways:

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

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

D. RELEASE of CLAIMS

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

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

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

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

E. EFFECT of FINAL PAYMENT

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

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

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

**ARTICLE 35
CONTRACTOR'S WARRANTY**

A. GENERAL WARRANTY

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

B. ONE-YEAR WARRANTY

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

(2) The one-year warranty for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The one-year warranty for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion,

and other Work performed after Substantial Completion, shall begin on the date of Final Acceptance of the Work. The Contractor's correction of Work pursuant to this warranty does not extend the period of the warranty. The Contractor's one-year warranty does not apply to defects or damages due to improper or insufficient maintenance, improper operation, or wear and tear during normal usage.

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

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

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

C. GENERAL CONTRACTOR'S ROOFING GUARANTEE

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

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

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

D. SPECIAL WARRANTIES

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

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

E. ASSUMPTION of GUARANTEES of OTHERS

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

ARTICLE 36
INDEMNIFICATION AGREEMENT

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

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

ARTICLE 37
CONTRACTOR'S and SUBCONTRACTORS' INSURANCE

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

A. GENERAL

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

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

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

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

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

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

B. INSURANCE COVERAGES

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

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

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

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

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

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

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

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

(b) Additional Requirements for Commercial General Liability Insurance:

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

(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE

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

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

(4) COMMERCIAL UMBRELLA OR COMMERCIAL EXCESS LIABILITY INSURANCE

(a) Commercial Umbrella or Commercial Excess Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile

Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.

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

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

(c) Additional Requirements for Commercial Umbrella or Commercial Excess Liability Insurance:

- .1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.
- .2 The policy must be on an "occurrence" basis.

(5) BUILDER'S RISK INSURANCE

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

(b) The policy shall be endorsed as follows:

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

- (i)** Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or
- (ii)** Partial or complete occupancy by Owner; or
- (iii)** Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

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

C. SUBCONTRACTORS' INSURANCE

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

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

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

D. TERMINATION of OBLIGATION to INSURE

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

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

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

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

E. WAIVERS of SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect’s consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder’s risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect’s consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work. **Any provision found herein which attempts to waive or invalidate the subrogation interests of Alabama’s State Insurance Fund against any party to this contract or any other person or entity is void and invalid. No such waiver is intended or made by the parties to this agreement with regard to any property insured by the State Insurance Fund.**

ARTICLE 38
PERFORMANCE and PAYMENT BONDS

A. GENERAL

Upon signing and returning the Construction Contract to the Owner for final approval and execution, the Contractor shall, at the Contractor's expense, furnish to the Owner a Performance Bond and a Payment Bond (P&P Bonds), DCM Forms C-6 and C-7 as contained in the Project Manual, each in a penal sum equal to 100% of the Contract Sum. Each bond shall be on the form contained in the Project Manual, shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount. 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 a power of attorney (POA) of the signing official. The POA signature date must be the same day as the P&P Bond's signature date. All signatures must be present.

The provisions of this Article are not applicable to this Contract if the Contract Sum is less than \$100,000, unless bonds are required for this Contract in the Supplemental General Conditions.

B. PERFORMANCE BOND

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

C. PAYMENT BOND

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

D. CHANGE ORDERS

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

E. EXPIRATION

The obligations of the Contractor's performance bond surety shall be coextensive with the

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

ARTICLE 39
ASSIGNMENT

The Contractor shall not assign the Contract or sublet it as a whole nor assign any moneys due or to become due to the Contractor thereunder without the previous written consent of the Owner (and of the Surety, in the case of a bonded Construction Contract). As prescribed by the Public Works Law, the Contract shall in no event be assigned to an unsuccessful bidder for the Contract whose bid was rejected because the bidder was not a responsible or responsive bidder.

ARTICLE 40
CONSTRUCTION by OWNER or SEPARATE CONTRACTORS

A. OWNER'S RESERVATION of RIGHT

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

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

B. COORDINATION

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

C. CONDITIONS APPLICABLE to WORK PERFORMED by OWNER

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

D. MUTUAL RESPONSIBILITY

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

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

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

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

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

ARTICLE 41 **SUBCONTRACTS**

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

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

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

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

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

B. SUBCONTRACTUAL RELATIONS

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

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

ARTICLE 42
ARCHITECT'S STATUS

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

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

C. ARCHITECT'S AUTHORITY

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

(1) The Architect is authorized to:

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

and Approval of payments, and
(f) issue Notices to Cure pursuant to Article 27.

(2) The Architect is not authorized to:

- (a) revoke, alter, relax, or waive any requirements of the Contract Documents (other than “minor” deviations and changes) without concurrence of the Owner,
- (b) finally approve or accept any portion of the Work without concurrence of the Owner,
- (c) issue instructions contrary to the Contract Documents,
- (d) issue Notice of Termination or otherwise terminate the Contract, or
- (e) require the Contractor to stop the Work except only to avoid the performance of Defective Work.

D. LIMITATIONS of RESPONSIBILITIES

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

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

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

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

E. ARCHITECT’S DECISIONS

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

ARTICLE 43
CASH ALLOWANCES

A. All allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner

and the Contractor shall afford the Owner the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.

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

ARTICLE 44

PERMITS, LAWS, and REGULATIONS

A. PERMITS, FEES AND NOTICES

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

B. TAXES

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

C. COMPENSATION for INCREASES

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

D. ALABAMA IMMIGRATION LAW

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

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

E. ALABAMA TRADE BOYCOTT LAW

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

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

EE. ALABAMA ECONOMIC BOYCOTT LAW

Per Act 2023-409 as codified in Title 41, Chapter 16, Article 1 of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, economic boycotts.

F. ACCOUNTING OF SALES TAX EXEMPT PROJECTS

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

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

ARTICLE 45
ROYALTIES, PATENTS, and COPYRIGHTS

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

infringement of a patent or copyright, the Contractor shall be responsible for any resulting loss unless such information is promptly furnished to the Architect.

ARTICLE 46
USE of the SITE

- A. The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials, equipment, employees' vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.
- B. Unless otherwise provided in the Contract Documents, temporary facilities, such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner. Such temporary buildings and/or utilities shall remain the property of the Contractor, and be removed at the Contractor's expense upon completion of the Work, unless the Owner authorizes their abandonment without removal.

ARTICLE 47
CUTTING and PATCHING

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

ARTICLE 48
IN-PROGRESS and FINAL CLEANUP

A. IN-PROGRESS CLEAN-UP

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

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

B. FINAL CLEAN-UP

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

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

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

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

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

(d) **Cleaning all tile, floor finish of all kinds:** Removal of all splatters, stains, paint, dirt, and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Architect.

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

C. OWNER'S RIGHT to CLEAN-UP

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

ARTICLE 49
LIQUIDATED DAMAGES

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

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

- C. If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.
- D. The amount of liquidated damages due under either paragraph B or C, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

ARTICLE 50 **USE of FOREIGN MATERIALS**

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

ARTICLE 51 **PROJECT SIGN**

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

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

END of
GENERAL CONDITIONS of the CONTRACT

SUPPLEMENTARY CONDITIONS

Attachment to: DCM Form C-8, General Conditions of the Contract, revised December 2024.

INTRODUCTION

The following supplements modify, change, delete from, or add to the "General Conditions of the Contract. Where any Article, of the General Condition is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause shall remain in effect.

ARTICLE 1: CONTRACT DOCUMENTS

Add the following in the "CONTENTS":

“ARTICLE 52: SALES AND USE TAX EXEMPTIONS”

“ARTICLE 53: COMPLIANCE WITH BEASON-HAMMOND ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT”

ARTICLE 4: DOCUMENTS FURNISHED TO CONTRACTOR (amended 7-18-17)

Add this article in its entirety:

For projects including a Construction Manager, each trade bid contractor shall be provided with (2) two sets of Contract Documents by the Architect and distributed by the Construction Manager. Additional copies requested will be provided at reproduction cost to the Contractor. Electronic copies (PDF format) will be provided at no cost to the Contractor.

ARTICLE 15: HAZARDOUS MATERIALS (Add the following contract form)

Comply with the requirements and provide an executed copy of attached “Asbestos Abatement Affidavit” as a part of Project Closeout.

ARTICLE 44: PERMIT FEES

In addition to other fees, the Contractor will include in his bid the permit fee required by the Division of Construction Management. See attached User Fee Schedule.

Exception: Fully locally-funded K-12 and fully locally-funded four-year public University projects with both a certified estimate after design completion of \$750,000 or less and a contract awarded on or after 10/01/22 for capital improvement or alterations, additions, repair, or maintenance of heating, ventilation, and air conditioning systems or any alterations, additions, repair, or maintenance of a roof, are exempt from DCM Permit Fees.

ARTICLE 52: SALES AND USE TAX EXEMPTIONS

Add this article in its entirety.

The project Owner is exempt from all state, county, and municipal sales and use taxes. Comply with Section 01291 “Sales and Use Savings”.

ARTICLE 53: COMPLIANCE WITH BEASON-HAMMOND ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT

Add this article in its entirety.

The contractor’s completed E-Verify Memorandum of Understanding must be attached to every construction contract for execution. The general contractor is required to obtain the E-Verify Memorandum of Understanding information from subcontractors and retain on file in their offices but should not submit the information with their contracts.

END OF SUPPLEMENTARY CONDITIONS



ALABAMA DEPARTMENT OF FINANCE REAL PROPERTY MANAGEMENT Division of Construction Management

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

Department Use Only
Invoice # _____

PERMIT FEE CALCULATION WORKSHEET

DCM # _____	Date _____
Project Name; Owner/Architect/Engineer Project # & Phase/Package # _____	
Owner Entity Name _____	
Architect/Engineer Firm Name _____	
Contractor Company Name _____	
Awarded Contract Sum: _____	
Email address(es) for Payment Receipt: _____	

BASIC PERMIT FEE CALCULATION:

Awarded Contract Sum up to \$100,000 \$200.00 fee

Awarded Contract Sum is \$100,001 - \$250,000 \$400.00 fee

Awarded Contract Sum is \$250,001 - \$1,000,000

Contract Sum less \$250,000= _____ /1,000 x \$0.80 + \$200.00= _____ x 2 = _____

Awarded Contract Sum is \$1,000,001 - \$10,000,000

Contract Sum less \$1,000,000= _____ /1,000 x \$0.60 + \$800.00= _____ x 2 = _____

Awarded Contract Sum is \$10,000,001 - \$50,000,000

Contract Sum less \$10,000,000= _____ /1,000 x \$0.40 + \$6,200.00= _____ x 2 = _____

Awarded Contract Sum is \$50,000,001 and up

Contract Sum less \$50,000,000= _____ /1,000 x \$0.20 + \$22,200.00= _____ x 2 = _____

TOTAL DUE: _____

Permit fees are not owed for fully locally funded K-12 and 4-year public University projects for capital improvement or alterations with estimated cost of \$750,000.00 or Less. Determination of whether a project is subject to the Locally-Funded \$750,000.00 or Less exception for inspections is based on the total of bids received for all phases and bid packages for the project. Inspections are still required for such projects.

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

Permit Re-Inspection Fee: A fee of \$1,500.00 per occurrence may be charged if (A) the contractor has not completed the work required for the particular inspection as detailed in DCM Form B-8: Pre-Construction Conference Checklist, or (B) the inspection is canceled or rescheduled without the required minimum 48 hours notice to all parties.

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

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

Fees may be paid online at www.dcm.alabama.gov (in which case a completed fee worksheet is not required). The Basic Permit Fee is subject to Final Reconciliation of Fees at the end of construction.

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

PRE-CONSTRUCTION CONFERENCE CHECKLIST

The following are recommended topics to be covered during the required Pre-Construction Conference. Contact the DCM Project Inspector **via DCM's Engage Portal** at least fourteen (14) days prior to scheduling the conference.

**Shall be discussed while owner is present*

	*1. Name and relationship to job of local Owner personnel
	2. Public officials involved
	3. Names of architect/engineer personnel involved
	4. Provide e-mail addresses on Pre-Construction Sign-in sheet
	5. Construction sets of plans available to contractor
	6. Verify alternates accepted, etc.
	7. Approved list of sub-contractors
	*8. Point of contact for project. Project Manager _____ Job Superintendent _____
	9. Approved cost breakdown (DCM Form C-10SOV) & Progress Schedule (DCM Form C-11)
	*10. Method of approving monthly payment requests <ul style="list-style-type: none"> • All State Agency, PSCA-funded University, and PSCA-funded K-12 projects: payment applications must be submitted via DocuSign PowerForm links available from DCM's Engage Portal. • Fully locally-funded University and fully locally-funded K-12 projects: submit payment applications per Owner requirements.
	*11. Time Extensions
	*12. Overall phasing of job
	13. Project limits
	14. Shop drawings, time to process
	*15. Sales tax savings (Alabama Department of Revenue)
	*16. Project sign and other job signs
	17. ADEM permit, if more than one acre of land is disturbed. <ul style="list-style-type: none"> • Coordinate offsite storm water drainage with the authority having jurisdiction when applicable.
	18. DCM Inspection Minimum Requirements.
	19. Advance notice for required DCM inspections The contractor will notify the architect by email of the date the project will be ready for an inspection by the Division of Construction Management. Inspections must be requested via DCM's Engage Portal 14 days in advance. When the DCM Inspector confirms the inspection date and time, the architect will send an email confirming the inspection date and time to all parties as well as a copy to inspections@rpm.alabama.gov . An Outlook calendar invite is also suggested for all inspections. Cancellations of any scheduled inspection must be received in writing no later than 48 hours prior to the scheduled inspection. If the inspection is canceled, it will be rescheduled subject to the DCM Inspector's availability. Cancellations received less than 48 hours in advance shall incur a \$1,500.00 re-inspection fee. If the project is not ready for the scheduled inspection, the General Contractor shall incur a \$1,500.00 re-inspection fee.

	<p>20. <u>Pre-Construction Conference</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Major Subs</p> <ul style="list-style-type: none"> • Fully-executed construction contract and Notice to Proceed • Verification of permit fee payment (Exception: fully locally-funded K-12 & public four-year University capital improvement, HVAC, or roof projects with an estimated cost of \$750,000.00 or Less, are exempt from DCM Fees.) • Fire alarm contractor and fire sprinkler contractor certification (from State Fire Marshal) • ADEM permit, if more than one acre of land is disturbed. • The General Contractor to perform and furnish all work, labor, services, supervision, materials, equipment, tools, scaffolds, appliances, insurance, taxes, and other things necessary to complete the work in strict accordance with all plans, specifications, and GENERAL CONDITIONS. The Contractor shall be liable for any omissions in contractor's bid proposal or any other interpretations made by contractor. All items of Work related to each are to be provided so that no gaps, omissions, or conflicts arise that prevents a complete and functioning result. • Contractor's duty to coordinate work of separate contractors.
	<p>21. <u>Pre-Construction Conference for Storm Shelter</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Structural Engineer, Major Subs, Special Inspections Representative</p> <ul style="list-style-type: none"> • The completed & signed DCM Form B-15: Owner's Statement of Responsibility for Tornado Storm Shelter (Hurricane Shelter Where Applicable) must be submitted to the DCM Inspector at Pre-Construction Conference. Must be kept with Owner's storm shelter records. • The completed & signed DCM Form C-17: Contractor's Statement of Responsibility for Construction of Tornado Storm Shelter (Hurricane Shelter Where Applicable) along with required Quality Assurance Plan (QAP) must be submitted to DCM Inspector at Pre-Construction Conference. • The completed and signed DCM Form B-14: Certification of Structural Observations from the Structural Engineer of Record must be attached to the Certificate of Substantial Completion form via DocuSign link available from DCM's Engage Portal. • Storm Shelter Impact-protective systems Listing and labeling: Impact-protective systems shall be listed and labeled. Marking: The following function and performance characteristics shall be provided on the label for each impact protective system tested: <ol style="list-style-type: none"> 1. Manufacturer's identification reference or listing number for the assembly. 2. Type of impact-protective system, such as window assembly, door assembly shutter assembly or louver. 3. Hazard: hurricane, tornado, or both. 4. Missile weight and speed. 5. Design wind pressure. 6. Edition of ICC 500.
	<p>22. <u>Pre-Roofing Conference</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Roofing Sub, Roofing Manufacturer's Representative</p> <ul style="list-style-type: none"> • This conference shall be conducted by the design professional as described in Chapter 5, Section C.4 of the DCM Manual of Procedures. • Roofing submittals must be approved by the architect prior to pre-roofing conference. • Roofing manufacturer must provide documentation that roof design and roofing materials meet code requirements for wind uplift and impact resistance. • Copy of sample roof warranty – Note: Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees. • Contractor shall video existing building interior and exterior prior to roofing operations and provide copy to owner. • General Contractor's Roofing Guarantee and Manufacturer's Roofing Warrantees must be presented to DCM Inspector at Final Inspection and submitted with Certificate of Substantial Completion for all projects via DocuSign PowerForm links available from DCM's Engage Portal.

	<p>23. <u>Above Ceiling Inspections</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, MEP Engineers, Major Subs</p> <ul style="list-style-type: none"> • All work must be completed except for installation of ceiling tiles, and/or hard ceilings. • Space must be conditioned. • Permanent power must be connected unless otherwise arranged with the DCM Inspector. • Grease duct must be inspected and approved by the DCM Inspector prior to fire wrapping and above-ceiling inspection.
	<p>24. <u>Life Safety Inspections and Final Inspection</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Engineers, Major Subs, Local Fire Marshal</p> <ul style="list-style-type: none"> • Fire alarm certification • Kitchen hood fire suppression system certification • General contractor's 5-year roofing guarantee (DCM Form C-9) • Roofing manufacturer's warranty • Above ground and below ground sprinkler certifications • Completed certificate of structural engineer's observations (for storm shelter) • Emergency and exit lighting tests. • Fire alarm must be monitored. • Elevator inspection completed and certificate of operation provided by the State of Alabama Department of Labor • Boiler/vessels inspection completed, and certificate of operation provided by the State of Alabama Department of Labor • Pressure test/Flush test for underground sprinkler lines (witnessed by local fire marshal, fire chief and/or DCM Inspector) • Flush/pressure test for new and/or existing fire hydrants • Must have clear egress/access and emergency (for first responders) access to building • Must have ADA access completed. • Comply with ADA requirements: plumbing fixture heights, toilet partition widths, turnaround, signage, parking lot striping and signage, etc. • Emergency Responder Radio Coverage
	<p>25. <u>Year-End Inspection</u>: Required Attendees: DCM Inspector, Contractor, Owner, Architect, Engineers and/or Major Subs may be required.</p> <ul style="list-style-type: none"> • Owner's list of documented warranty items • Reconciliation of user fees with DCM shall be completed prior to inspection
	<p>26. Other inspections required before work is covered</p>
	<p>27. Third-party inspections/special inspections. Structural components, Roofing, Geotechnical, Commissioning, lab tests, etc.</p>
	<p>28. Procedure if bad soil or rock is encountered: Geotech and special inspections</p>
	<p>29. Inspection report distribution – weekly per Owner-Architect Agreement. All site inspections and observations are to be recorded and transmitted to the DCM Inspector via DCM's Engage Portal. The design professional must also concisely report any deficiencies encountered, problems or questions raised by the contractor, instructions or answers given to the contractor, and administrative or construction delays observed. The design professional must endeavor to write his or her reports utilizing descriptions of components and areas that are consistent with descriptions contained in the plans and specifications so that the "third-party reader" can understand what is being discussed and where it is located in the project. Photographs may be included for clarity. Keep photos to a minimum. Each report shall also be distributed by the design professional to the Owner and contractor promptly after conducting an inspection so that all parties are kept current regarding events on the project.</p>
	<p>30. Ready mix plant, file delivery tickets, slump tests, cylinders. Quality of concrete work; concrete testing</p>
	<p>31. Light gauge metal roof framing and/or wood truss framing to be inspected by the structural engineer.</p>

	32. Record Drawings and As-Built Drawings: Contractor will maintain a set of drawings designated solely for As-Built Drawings to satisfy its closeout requirements. Contractor/Subcontractor shall, on a weekly basis, record all changes, revisions, modifications, additions, etc. to accurately reflect its completed work.
	33. Protection Of the Work: The General Contractor shall carefully secure and protect the work and all materials, equipment, or work of Sub-Contractors and others in the vicinity of the work and shall be liable for any loss or damage that results from Contractor`s failure to do so.
	*34. Use of site and existing building, access drive, signs
	*35. Conduct of contractor`s personnel: No interaction with staff and/or students. No foul language, no smoking or use of tobacco products, no drugs, and no firearms on school property.
	*36. Use of existing toilets
	*37. Coordinate any utilities supplied by Owner
	*38. Coordinate outages and work in existing building with Owner
	*39. Keeping existing exit paths open
	*40. Routine job clean-up to be perform daily. Clean-up areas where work is performed including paths of access/egress utilized by Contractor`s personnel and equipment. All generated waste and debris will be placed in dumpsters or other containment boxes.
	41. O.S.H.A. - Report all accidents - safety General Contractor's responsibility
	42. Contractor is reminded of obligation to comply with the Alabama Child Labor Law and E-Verify
	43. Building location relative to critical property line, easement, setback, etc.
	44. Surveyor to check foundation wall if location critical
	45. Verify sanitary outfall before committing floor level
	46. Procedure if bad soil or rock is encountered: Geotech and special inspections
	47. Stockpiling topsoil
	48. Protecting trees
	49. Soil Treatment, mix on site in presence of Job Superintendent
	50. What is expected of masonry work, mortar additive
	51. Problems with hollow metal - install proper fire labels
	52. Potential conflict of mechanical and electrical equipment; shop drawings
	53. Return air plenums (no combustibles)
	54. Fire damper installation issues
	55. Kraft-faced insulation is not to be installed exposed.
	56. Coordinate with local fire authority to assure access to the building for firefighting equipment during construction and before final acceptance. Provide fire extinguishers as required.
	57. Comply with fire hydrant requirement; coordinate with local Fire Authority or State Fire Marshal.
	*58. Certificate of Substantial Completion/Final Inspection All projects: Certificate must be activated via DocuSign link after final inspection and receipt of DCM Inspector`s report. The correct DocuSign link is available from DCM's Engage Portal .
	59. Release of retainage – 30 days to complete punch list and closeout
	*60. Project Closeout - precedes Final Payment <ul style="list-style-type: none"> a. Warranties b. Operating and Maintenance Manuals c. As-built Drawings d. Other requirements

61. Advertisement of Completion - start ad after substantial completion

- a. for projects less than \$100,000.00, Advertisement of Completion is not required.
- b. for projects \$100,000.00 or more, Contractor advertises for 3 weeks. The contractor can publish a notice using one or more of the following methods:
 - In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.
 - On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.
 - On a website utilized by the awarding authority for publishing notices.
 - If no newspaper is published in the county in which the work was done, and if the awarding authority does not utilize a website for the purpose of publishing notices, the notice may be given by posting at the courthouse for 30 days, and proof of the posting of the notice shall be given by the awarding authority and the contractor.

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

770 Washington Avenue, Suite 444
Montgomery, AL 36104
(334) 242-4082, inspections@rpm.alabama.gov

PRE-ROOFING CONFERENCE CHECKLIST

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 job record and copies furnished to the General Contractor, the Awarding Authority/Owner, the Technical Staff, and the DCM Project Inspector. The following are recommended topics to be covered during the required Pre-Roofing Conference. Contact the DCM Project Inspector for scheduling at least fourteen (14) days in advance of the desired conference date.

	*1. Name and relationship to job of local Owner personnel.
	2. Public officials involved.
	3. Names of Architect/Engineer personnel involved.
	4. Provide e-mail addresses on Pre-Construction Sign-in sheet.
	5. Description of each roofing system(s) involved in the project.
	6. Verify Roofing Contractor is Qualified by the Roofing Manufacture and capable of providing all specified warranties.
	7. Construction sets of plans available to contractor.
	8. Verify alternates accepted, etc.
	9. There shall be no deviations made from the drawings or specifications without prior written approval from the architect.
	*10. Review all Factory Mutual and Underwriters Laboratories requirements listed in the specifications and resolve any questions or conflicts that may arise.
	*11. Manufactures Roofing Warranties must be dated within 30 days of the date of the Substantial Completion or Final Inspection cannot be held.
	*12. Sample of Manufacturer's Warranty review for comparison to specified warranty. Roofing Certification Form and Severe Hail Rider are warranty components. <i>Note: Warranties must include language that allows disputes to be settled in the State of Alabama.</i>
	13. All Required Roofing Warranties in hand and fully executed at the Final Inspection to achieve substantial completion: This includes Manufacturers' and DCM Form C-9 Five Year Warranty issued by the General Contractor and/or Roofing Contractor.
	14. Establish weather and working temperature conditions to which all parties must agree.
	15. Coordinate all work activity with the Owner. Work should not disrupt Owner's operation such as with noise or fumes. Temporary measures are to be considered to stop existing mechanical intake operation if disturbing fumes are anticipated.
	*16. Establish areas on the job site that will be designated as work and storage areas for roofing operations.
	17. Deck shall provide adequate drainage. There shall be NO standing or pooling of water on the roof for the time specified per the roofing manufacture after a rain event.
	18. Mechanical, plumbing, and electrical contractor shall coordinate with roofing contractor for any roof penetrations. The roofing contractor shall install all roof penetrations. Curbs and flashings provided must be accepted by roofing contractor and manufacturer. <i>Note: Maintain the minimum clearance as specified by the Roofing Manufacture for penetrations from wall, parapets, curbs, etc.</i>
	19. Verify Manufactures and/or Special inspections to be performed. It is strongly recommended that the Awarding Authority/Owner and design professional consider employing the services of an experienced and totally non-proprietary roofing consultant to make periodic inspections of the in-progress work and submit written reports of application quality and progress.

	20. Do not remove more than can be recovered daily. Protect the building interior daily. Contractor is responsible for weather damages.
	21. Protection During Application: At no time during construction should the surface of an asphalt or coal tar pitch roofing system be left unprotected. A glaze coat of asphalt or pitch must be applied to the surface of the membrane if the top pour or cap sheet cannot be applied during the same day.
	22. Store roofing materials in a safe and protected location. Shipping packaging is not considered proper covering from the elements. Insulation must be protected with tarps. WET INSULATION MATERIALS WILL BE REJECTED.
	23. All manufacturer markings should be removed from the roof and comments be resolved prior to final inspection.
	24. Routine Job Clean-up: <ul style="list-style-type: none">a. Debris to be removed daily from the roof and grounds and removed from the site when dumpster becomes full. Do not allow dumpster to spill over or debris to be blown. Burning of trash on site is not allowed.b. Locate dumpsters away from existing buildings.c. Secure and protect any new materials stored on site
	25. 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. Roof shall be cleaned from all debris including material spills prior to final inspection.
	26. Contractor should video survey the interior and exterior of the building with the Owner prior to starting work. Provide advance notice for required DCM inspections.
	27. Safety/OSHA: Safety is the contractor's responsibility. As a courtesy, notify the Architect if there has been any problem.

ASBESTOS AFFIDAVIT

DATE: _____

BUILDING OWNER: _____

PROJECT: _____

To Whom It May Concern:

The undersigned certifies that to the best of his knowledge, no products containing asbestos have been included in the construction of the captioned project. Special care was exercised to avoid asbestos containing products including reviewing product data sheets, reviewing product labels, and visually verifying products in the field. Special care to avoid asbestos has been used in the selection, purchase, and installation of products including, but not limited to, the following: concrete, batt insulation, roof insulation, building felts, mastics, waterproofing products, adhesives, resilient flooring products, ceiling tiles, interior coatings, exterior coatings, roofing, pipe insulation, duct insulation, and pre-assembled items of equipment.

Respectfully submitted.

Signature

Typed Name

Title

Firm Name

Address

Sworn and subscribed before me this _____ day of _____, 20____.

Notary Public

County, State

My commission expires _____.

DCM (BC) No. _____

PSCA Projects: PSCA No. _____

Application No. _____

Date: _____

APPLICATION and CERTIFICATE for PAYMENT

Attach DCM Form C-10SOV: Schedule of Values

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

A. Total Original Contract	\$	
B. Fully Executed (signed by all parties) Change Order(s) Numbers ___ through ___	+\$	
C. Total Contract To Date	\$	
1. Work Completed to Date per attached Schedule of Values <small>(Form C-10SOV's Column F Total)</small>	\$	
2. Materials Presently Stored <small>(When this amount is greater than \$0.00, attach Form C-10SM: Inventory of Stored Materials, or similar list)</small>	+\$	
3. Total Work Completed to Date & Materials Presently Stored (_____% of Contract To Date)	\$	
4. Less Retainage <small>(If Total Work Completed to Date & Materials Presently Stored (#3) is less than or equal to 50% of Total Contract to Date (C), Retainage = #3 x 0.05. Once #3 exceeds 50% of C and up until project is complete, Retainage = C x 0.025. \$0 is retained on final payment application, see 9th bullet point below for requirements.)</small>	-\$	
5. Total Due	\$	
6. Less Total Previous Payments Billed <small>(Must exactly match #5 Total Due from previous payment application. # 6 is \$0.00 if there is no previous payment application)</small>	-\$	
7. Balance Due This Estimate	\$	

Final pay app? Yes.

CONTRACTOR'S CERTIFICATION

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

By: _____ Date: _____
Contractor's Signature

Name & Title _____

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

Seal: _____

Notary Public's Signature

ARCHITECT'S / ENGINEER'S CERTIFICATION

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

By _____
Architect's / Engineer's Signature

Name & Title _____

Date _____

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

APPROVAL

Owner Entity

By _____
Signature

Name & Title _____

Date _____

SCHEDULE OF VALUES (SOV)

DCM Form C-10SOV
Revised October 2021

Project:	DCM (BC) Project Number:			
	PSCA Project Number, if any:			
Contractor Company:	Application Number:			
	Application Date:			
	Period From:		Period To:	

A	B	C	D		E	F	G	H	I	J
Item No.	Description of Work	Scheduled Value (including fully executed [signed by all parties] change order amounts)	Work Completed		Total Work Completed to Date (This application SOV's D + E)	Materials Presently Stored (G total greater than \$0 must match C-10SM's column E total. This SOV's G amounts are not in this SOV's D nor E amounts.)	Total Work Completed to Date & Materials Presently Stored (This SOV's F + G)	Percent of Contract Completed to Date (This SOV's H / C)	Retainage (This column's Total's cell formula calculates the applicable variable rate)	
			Work Previously Completed (Previous pay app SOV's column F. D is \$0 if this SOV is for first pay app.)	Work Completed This Period (Period as noted above)						
1.					\$ -		\$ -			Retainage Variable Rate: If Total Work Completed to Date & Materials Presently Stored (H) is less than or equal to 50% of Total Scheduled Value (C), Retainage = H x 0.05. Once H exceeds 50% of C and up until project is complete, Retainage = C x 0.025. There will be no retainage on final payment application.
2.					\$ -		\$ -			
3.					\$ -		\$ -			
4.					\$ -		\$ -			
5.					\$ -		\$ -			
6.					\$ -		\$ -			
7.					\$ -		\$ -			
8.					\$ -		\$ -			
9.					\$ -		\$ -			
10.					\$ -		\$ -			
11.					\$ -		\$ -			
12.					\$ -		\$ -			
13.					\$ -		\$ -			
14.					\$ -		\$ -			
15.					\$ -		\$ -			
16.					\$ -		\$ -			
17.					\$ -		\$ -			
18.					\$ -		\$ -			
19.					\$ -		\$ -			
20.					\$ -		\$ -			
21.					\$ -		\$ -			
22.					\$ -		\$ -			
23.					\$ -		\$ -			
24.					\$ -		\$ -			
25.					\$ -		\$ -			
TOTALS:		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

This pay app SOV's column totals must match amounts in this pay app Form C-10 per the following indicated Form C-10 line #s:	C.	None	None	1.	2.	3.	3.	4.
--	----	------	------	----	----	----	----	----

Note: If this SOV's column G: Materials Presently Stored includes any amounts other than \$0, then DCM Form C-10SM: Inventory of Stored Materials with back-up receipts must be submitted as part of the payment application documentation.

FINAL PAYMENT CHECKLIST (FPC)

To be completed by the Architect/Engineer and submitted to DCM for review *via the correct DocuSign link from the Engage Portal*; applicable only to state agencies, partially or fully PSCA-funded and other bond-funded projects. The FPC shall include all attachments including the Contractor's Application for Final Payment. If all PSCA funds are expended prior to Final Payment, it is not a requirement to submit the Application & Certificate for Final Payment along with the supporting documentation to DCM.

(For further guidance refer to Article 34/Final Payment of DCM Form C-8: General Conditions of the Contract.)

PROJECT:		DCM No. _____
		PSCA No. _____ <small>(If applicable)</small>
YES	N/A	Select "YES" or "N/A" as applicable.
<input type="checkbox"/>	<input type="checkbox"/>	Application and Certificate for Final Payment, DCM Form C-10: Attach one copy to FPC. The application must include original signatures of all parties and include all application attachments.
<input type="checkbox"/>		Certificate of Substantial Completion, DCM Form C-13: Attach one fully-executed copy to FPC.
<input type="checkbox"/>		Affidavit of Advertisement for Completion: Attach one copy of the affidavit of publication, including the image of the advertisement which may be based on DCM Form C-14 , to the FPC. An affidavit is a legal document issued by the publisher, which must be requested from the publisher.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's Affidavit of Payment of Debts & Claims, DCM Form C-18: Attach one copy to FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's Affidavit of Release of Liens, if required by Owner, DCM Form C-19: Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Consent of Surety to Final Payment, if any, To Contractor, DCM Form C-20: Consent is required for projects with P&P Bonds. Original has been delivered to Owner. Attach one copy to FPC.
<input type="checkbox"/>	<input type="checkbox"/>	General Contractor's Roofing Guarantee, DCM Form C-9, and Other Specified Roofing Guarantees, if any: Attached to Certificate of Substantial Completion.
<input type="checkbox"/>	<input type="checkbox"/>	Contractor's One-Year Warranty: Original has been delivered to the Owner. Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Other Warranties: All other specified original warranties has been delivered to the Owner. Attach one copy to the FPC.
<input type="checkbox"/>	<input type="checkbox"/>	Record Documents: Specified "As-built" plans and specifications have been delivered to the Owner.
<input type="checkbox"/>		O & M Manuals: Specified instructions and O&M Manuals have been delivered to the Owner.
<input type="checkbox"/>	<input type="checkbox"/>	Time Extension: Over-run of Contract Time has been reconciled by: <input type="checkbox"/> Change Order <input type="checkbox"/> Liquidated Damages <input type="checkbox"/> Attached explanation
<input type="checkbox"/>	<input type="checkbox"/>	Additional Documents or Explanations which are attached:
Submitted By: _____		
Architectural / Engineering Firm		
_____	_____	_____
Signature	Printed Name and Title	Date

Final Reconciliation of Fees: Between the final change order execution and the year-end inspection, report the final project cost to **the Engage Portal at <https://engagealabama-rpm.facilityforce.cloud>** (back-up is not needed unless requested by DCM). DCM will then email a Final Reconciliation of Fees Statement to the Owner. If the Final Statement shows a net payment is owed to DCM, that amount must be paid prior to scheduling the year-end inspection. If the Final Statement shows a net refund is owed then a check will be mailed to the Owner.

SAMPLE PROGRESS SCHEDULE & REPORT			CONTRACTOR (Contractor may use own form in lieu of Form C-11):				DATE OF REPORT:			
DCM (BC) No.:							PROCEED DATE:			
PSCA projects: PSCA No.:							ARCHITECT/ENGINEER:			
PROJECT:										

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: USE ADDITIONAL SHEETS IF JOB IS SCHEDULED OVER 12 MONTHS.

ANTICIPATED ACTIVITY ACTUAL ACTIVITY ANTICIPATED CASH FLOW ACTUAL CASH FLOW

DCM Form C-11
August 2021



Alabama Department of Finance

Real Property Management

Division of Construction Management

P.O. Box 301150, Montgomery, AL 36130-1150
770 Washington Ave, Ste 444, Montgomery, AL 36104
(334) 242-4082 (phone)



Change Order Guidance

See C-8: General Conditions of the Contract; Article 19: Changes in the Work, & Article 23: Delays at https://dcm.alabama.gov/PDF/forms/C-8_Gen_Cond.pdf

Responses to Frequently Asked Questions

- There must be back-up for each item; each item must include a breakout of material and labor and its total.
- On the GC's Summary, each \$ amount for a subcontractor must have subcontractor's quote as backup.
- Subtotals on the General Contractor's (GC's) Summary must match subtotals on any subcontractors' paperwork.
- GC quotes and subquotes must be broken down by labor (hours and rates), materials including quantities and unit prices (with receipts or quotes attached), equipment whether rented or owned (with receipts or quotes attached), and Overhead & Profit (OH&P).
- GC's Summary and back-up invoices cannot include sales tax and cannot include charges for bonds.
- Total OH&P of each item can be maximum of 25% divided among GC & subcontractors. GC can have maximum of 15% OH&P. GC and subcontractors cannot include insurance in addition to OH&P.
 - Correct OH&P calculation example: 15% OH&P of a \$100.00 item is \$15.00, for a total of \$115.00.
 - False OH&P calculation example: For 15% OH&P, sometimes contractors will list 10% as OH of a \$100.00 item for an OH of \$10.00, add it to item for a subtotal of \$110.00, then calculate 5% Profit of \$110.00 subtotal as \$5.50 and add it all together for a total of \$115.50, but that is an incorrect calculation.
- Deductive change orders: Same backup as noted above is needed, including breakdown of material and labor, and must also deduct OH&P if included in original bid. Include specification section regarding allowances.

Weather Delays

If additional days are requested due to weather, backup for such must be provided. Besides the following examples, alternate methods of calculation may be acceptable.

Example 1 - Provide a table displaying:

- Daily precipitation (in inches) at the site during the month associated with the report.
- The number of days in which the contractor **can anticipate precipitation** above 0.10 inches, for that particular calendar month, based on NOAA data from a location within the vicinity of the project (5-year average).
- The number of days in which the contractor **actually experienced precipitation** above 0.10 inches.
- Calculation: $c - b =$ number of allowable weather delay days awarded to extend contract time.

Example 2 – Provide a summary and proof; summary can be written/typed on proof:

Summary:

- Number of lost days.
- Total amount of actual rainfall for the lost days.
- Average amount of rainfall of the past five years' pertinent month(s) for the matching month(s) of the lost days included in this change order.
- Calculation: $((B - C)/B) \times A =$ number of days requested to be added to the schedule via change order.

Proof (website data, for example NOAA data, is acceptable proof):

- Proof of the lost days.
- Proof of the average amount of rainfall of the past five years' pertinent month(s).

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

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

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

CONTRACT CHANGE ORDER

Change Order No. _____ Date _____ DCM (BC) No. _____

TO: (Contractor) Co. Name: Address:	PROJECT:
--	-----------------

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

_____.

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

Description continued from Page 1:

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

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

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

Architectural/Engineering Firm

Recommended By _____
Name & Title _____

APPROVAL

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

By _____ Date: _____
State Superintendent of Education

CONTRACTING PARTIES

Contractor Company

By _____
Name & Title _____

Awarding Authority/Owner Entity

By _____
Name & Title _____

CONSENT OF SURETY (for additive \$ change orders only)

Surety Company

By _____
(Attach current Power of Attorney)
Name & Title _____

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

TO: **Alabama Department of Finance**
Real Property Management
Division of Construction Management
 770 Washington Avenue, Suite 444
 Montgomery, Alabama 36104
 (334) 242-4082 FAX (334) 242-4182

CHANGE ORDER JUSTIFICATION

Change Order No. _____

Date: _____

DCM (BC) No. _____

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

(A)	PROJECT NAME & LOCATION:	OWNER ENTITY NAME & ADDRESS:
	CONTRACTOR COMPANY NAME & ADDRESS:	ARCHITECTURAL / ENGINEERING FIRM NAME & ADDRESS:
(B)	DESCRIPTION OF PROPOSED CHANGE(S): ATTACH CONTRACTOR'S DETAILED COST PROPOSAL(s)	
	AMOUNT: <input type="checkbox"/> ADD <input type="checkbox"/> DEDUCT \$ _____ TIME EXTENSION: _____ CALENDAR DAYS	
(C)	ORIGINAL CONTRACT AMOUNT \$ _____ + \$ _____ = \$ _____	PREVIOUS C.O.'s _____ THRU _____ CONTRACT AMOUNT PRIOR TO PROPOSED CHANGE ORDER
(D)	JUSTIFICATION FOR NEED OF CHANGE(S):	
(E)	JUSTIFICATION OF CHANGE ORDER vs. COMPETITIVE BID:	
(F)	ARCHITECT / ENGINEER'S EVALUATION OF PROPOSED COST:	
(G)	CHANGE ORDER RECOMMENDED _____ ARCHITECTURAL / ENGINEERING FIRM NAME By: _____ ARCHITECT / ENGINEER'S SIGNATURE By: _____ OWNER'S PROJECT REPRESENTATIVE'S SIGNATURE	CHANGE ORDER JUSTIFIED AND APPROVED _____ LOCAL OWNER ENTITY NAME By: _____ OWNER'S SIGNATURE By: _____ OWNER'S LEGAL COUNSEL'S SIGNATURE

CHANGE ORDER JUSTIFICATION: PURPOSE and INSTRUCTIONS

PURPOSE

The awarding of work through an existing contract may potentially conflict with, or violate, the "Competitive Bid Laws" of the State of Alabama. **The determination of legality of Change Orders rests with the Awarding Authority and its legal advisor.** In a June 15, 1979, Opinion, the Office of the Attorney General offered guidelines for making such determinations in conjunction with considering the facts and merits of each situation. The purpose of the CHANGE ORDER JUSTIFICATION is to provide a means through which the Awarding Authority considers these guidelines and the intent of the "Competitive Bid Laws" when authorizing Change Orders. Pursuant to these guidelines, the following types of changes meet the criteria for awarding work through Change Orders in lieu of through the Competitive Bid process:

- I. Minor Changes for a monetary value less than required for competitive bidding.
- II. Changes for matters relatively minor and incidental to the original contract necessitated by unforeseeable circumstances arising during the course of the work.
- III. Emergencies arising during the course of the work of the contract.
- IV. Bid alternates provided for in the original bidding where there is no difference in price of the change order from the original best bid on the alternate.
- V. Changes of relatively minor items not contemplated when the plans and specifications were prepared and the project was bid which are in the public interest and which do not exceed 10% of the contract price.

Under these guidelines the cumulative total of Change Orders, including any negotiations to bring the original contract price within the funds available, would become questionable if the total of such changes and negotiations exceed 10% of the original contract price. These guidelines are not intended to interfere with the Awarding Authority's good faith discretion to respond to specific situations in the public's best interest. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign the Change Order Justification prior to submission to the Division of Construction Management (DCM).

INSTRUCTIONS

The CHANGE ORDER JUSTIFICATION is to be prepared by the design professional, who has evaluated the fairness and reasonableness of the proposed cost of the change(s) and recommends that the proposed Change Order be executed. The fully executed Form B-11: CHANGE ORDER JUSTIFICATION must accompany the proposed DCM Form C-12: Change Order. Instructions for completing the B-11 form are:

1. Insert the proposed Change Order Number, date of the Justification, and DCM (BC) Project Number in the spaces provided in the upper right-hand corner.
2. **Section (A):** Insert the complete name and address of the PROJECT, OWNER, CONTRACTOR, AND ARCHITECT/ENGINEER.
3. **Section (B):** Provide a complete description of the proposed changes in work, referring to and attaching revised specifications and/or drawings as appropriate. An attachment may be used if additional space is needed, but insert the proposed amount and time extension of the change(s) in the spaces provided. **Attached a copy of the contractor's detailed cost proposal.**
4. **Section (C):** Insert the Original Contract amount, the net increase or decrease of previous Change Orders, and the Current Contract amount (preceding the currently proposed Change Order).
5. **Section (D):** Explain why it is necessary, or in the public's interest, to make the proposed change(s) to the Work.
6. **Section (E):** Explain why award of the changed work to the existing contractor instead of awarding the work under the competitive bid process is justified.
7. **Section (F):** The design professional must state his evaluation of the reasonableness and fairness of the proposed costs based upon his review of the contractor's proposal.
8. **Section (G):** The design professional must recommend the Change Order to the Owner by signing the document; the Owner may require such recommendation from other individuals. The Owner must sign the document indicating that they believe change order action in lieu of the competitive bid process is justified for the proposed change(s). **Review of the matter and signing of the document by the Owner's legal counsel is highly recommended. If the cumulative change order amount exceeds 10% of the original contract amount then the Owner's legal consultant must sign the Change Order Justification prior to submission to DCM.**

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

770 Washington Avenue, Suite 444
 Montgomery, AL 36130-1150
 (334) 242-4082

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

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

CERTIFICATE OF SUBSTANTIAL COMPLETION

ROUTING PROCEDURES ON NEXT PAGE

DCM (BC) No. _____

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

Substantial Completion has been achieved for the entire Work the following portion of the Work:

_____.

The **Date of Substantial Completion** of the Work covered by this certificate is established to be _____.

"Substantial Completion" means the designated Work is sufficiently complete, in accordance with the Contract Documents, such that the Owner may occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work. The Date of Substantial Completion is the date upon which all warranties for the designated Work commence, unless otherwise agreed and recorded herein.

Punch List: A _____ page list of items to be completed or corrected prior to the Owner's approval of Final Payment is attached hereto, but does not alter the Contractor's responsibility to complete or correct all Work in full compliance with the Contract Documents. The Contractor shall complete or correct all items on the attached list, ready for re-inspection for Final Acceptance, within 30 days after the above Date of Substantial Completion, unless another date is stated here: _____.

If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item.

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

RECOMMENDED BY <i>(signature and email address required):</i>	
ARCHITECT/ENGINEER: _____	DATE: _____
CONTRACTING PARTIES:	
CONTRACTOR: _____	DATE: _____
OWNER: _____	DATE: _____
_____	DATE: _____

<input type="checkbox"/> DCM recommends occupancy, subject to completion of all Punch List items referenced above.	
<input type="checkbox"/> DCM does NOT recommend occupancy. Violations of State Building Code have been identified but not corrected. DCM signatures below do not indicate concurrence with occupancy. List of violations are attached.	
DCM INSPECTOR: _____	DATE: _____
DCM CHIEF INSPECTOR: _____	DATE: _____
DCM DIRECTOR: _____	DATE: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION ROUTING PROCEDURE

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

ARCHITECT/ENGINEER: Sign and date document, then mail it to Contractor. Provide Owner with DCM Inspector's name & field office address; territories and addresses are available at www.dcm.alabama.gov/staff.aspx.

CONTRACTOR: Sign and date document, then mail it to Owner.

OWNER: Sign and date document, then mail it to DCM Inspector's field office address; DCM Inspector territories and addresses are available at www.dcm.alabama.gov/staff.aspx.

DCM INSPECTOR: Sign and date document, then mail it to DCM Montgomery office.

DCM OFFICE: After review and signature/date by DCM Chief Inspector and DCM Director, DCM office will mail the fully-executed original document to Owner and will email copies to all parties.

NOTICE

THE EXECUTED "GENERAL CONTRACTOR'S ROOFING GUARANTEE" (DCM Form C-9) AND ANY OTHER ROOFING WARRANTY REQUIRED BY THE CONTRACT MUST ACCOMPANY THIS CERTIFICATE TO OBTAIN DCM APPROVAL.

Also, any standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

SAMPLE FORM OF ADVERTISEMENT FOR COMPLETION

LEGAL NOTICE

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

that _____,
(Contractor Company Name)

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

at _____,
(Insert location data in County or City)

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

(Architect / Engineer)

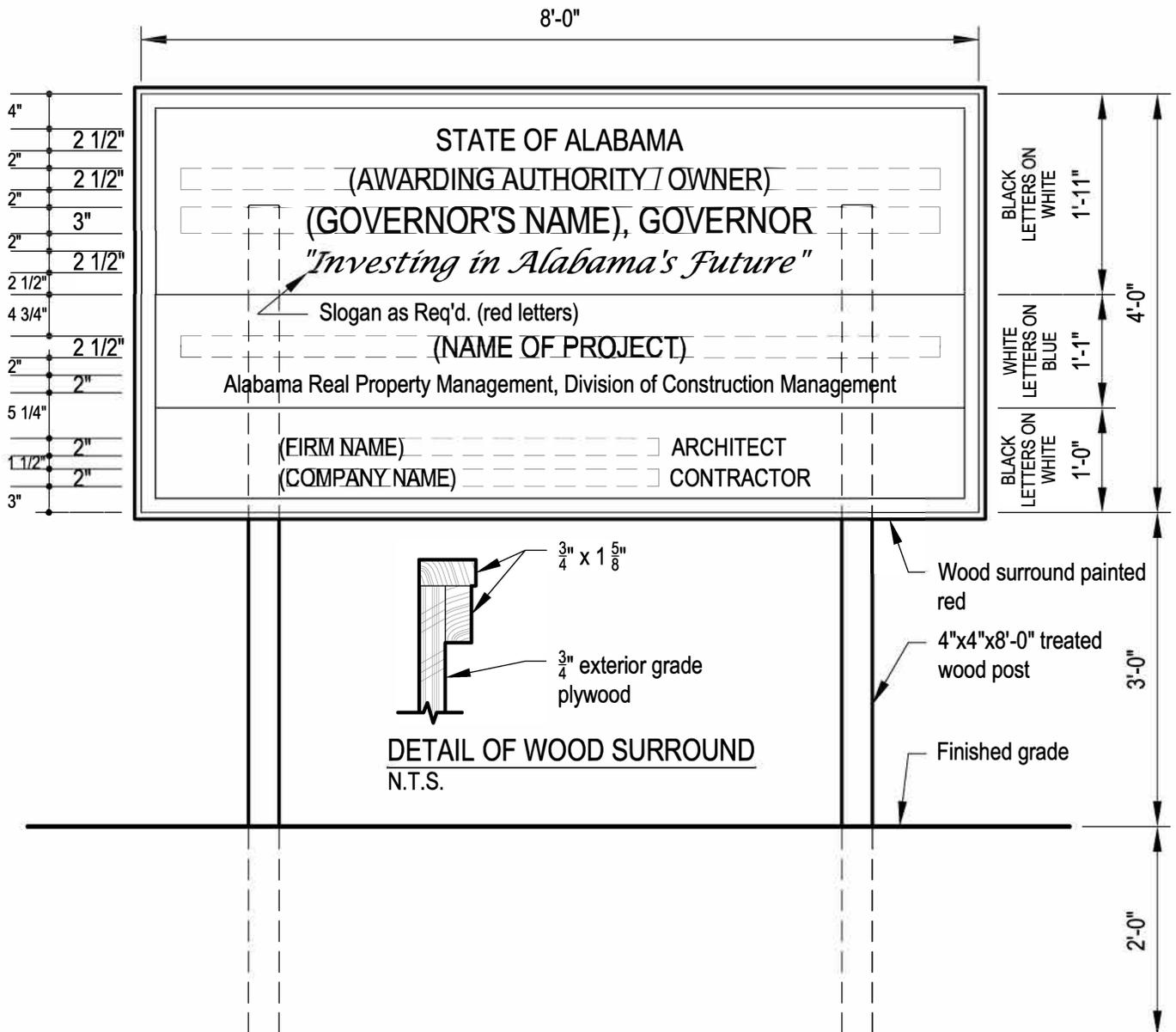
(Contractor)

(Business Address)

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

DETAIL OF PROJECT SIGN

N.T.S.



Notes:

1. Fully locally-funded State Agency and Public University projects: DCM Form C-15 must be included in the project manual regardless of expected bid amount. If the awarded contract sum is \$100,000.00 or more, Contractor shall furnish and erect a project sign.
Fully locally-funded K-12 school projects: Project sign is not required unless requested by Owner, if project sign is requested by Owner, include DCM Form C-15 in the project manual.
Partially or fully PSCA-funded projects: DCM Form C-15 must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of contract sum. "Alabama Public School and College Authority" as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects. **Exception: Alabama Community College System (ACCS) PSCA-funded projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.**
Fully locally-funded ACCS projects with Notice-To-Proceeds issued prior to August 1, 2021: DCM Form C-15 must be included in the project manual regardless of expected bid amount. If the awarded contract sum is \$100,000.00 or more, Contractor shall furnish and erect a project sign.
2. Sign to be constructed of 3/4" exterior grade plywood.
3. Paint with two coats best grade exterior paint before letters are painted. Option: In lieu of painted lettering on plywood, a corrugated plastic sign (displaying the same lettering, layout and colors as above) may be secured directly to the unpainted exterior grade plywood.
4. Sign shall be placed in a prominent location and easily readable from existing street or roadway.
5. Sign shall be maintained in good condition until project completion.
6. Slogan: Act 2020-167's title "Investing In Alabama's Future" should be placed on the project signs of all PSCA-funded projects, otherwise the Awarding Authority/Owner's slogan, if any, should be used. If the Awarding Authority/Owner of a fully locally-funded project does not have a slogan, the project sign does not require a slogan.

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Payment of Debts and Claims

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

STATE OF:

COUNTY OF:

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

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. DCM Form C-20, Consent of Surety to Final Payment, may be used for this purpose.

Indicate attachment: Yes No

The following supporting document should be attached hereto if required by the Owner:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.
3. Contractor's Affidavit of Release of Liens, DCM Form C-19.

Contractor (*Insert company name and address*):

By: _____
Signature of authorized representative

Name and Title

Sworn to and subscribed before me this _____ day
of _____, _____.

Notary Public's Signature

My commission expires: _____

Seal:

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Release of Liens

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

STATE OF:

COUNTY OF:

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

EXCEPTIONS:

Supporting Documents Attached Hereto:

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

Contractor (*Insert company name and address*):

By: _____
Signature of authorized representative

Name and Title

Sworn to and subscribed before me this _____ day
of _____, _____.

Notary Public's Signature

My commission expires: _____

Seal:

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Surety's Bond Number: _____

CONSENT OF SURETY TO FINAL PAYMENT

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

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

Surety (*Insert name and address of Surety*)

on bond of

Contractor (*Insert name and address of Contractor*)

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

Owner (*Insert name and address of Entity*):

as set forth in said Surety's bond.

SIGNED AND SEALED this _____ day of _____, _____.

SURETY:

Seal:

Company Name

By _____
Signature of Authorized Representative

Printed Name and Title

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each of the original forms to be attached to each of the four (4) final payment forms.

CONTRACTOR GUARANTEE

DATE

Chilton County Board of Education
1705 Lay Dam Road
Clanton, Alabama 35045

PROJECT: Verbena High School Gymnasium, Verbena, Alabama

_____ of _____
shall and hereby does warrant that all material and workmanship shall be of the quantity, quality and character specified and shown, and that any defect due to our non-compliance with the specifications and drawings, discovered and made known to us within one (1) year after the date of substantial completion shall be made good by us without additional expense to the owner, provided such defects or failures are not due to abuse, neglect or lack of reasonable and ordinary maintenance.

All bills on labor, materials and incidentals incurred by us in connection with the above-described work have been paid in full as of this date and that there are no obligations, demands, debts, outstanding liens or suits of liabilities against said project as a result of our work, and that no liens are threatening against said property.

Trade Contractor

By

Title

This day the _____ of _____ 20____

GENERAL CONTRACTOR'S ROOFING GUARANTEE

DCM Project No. _____

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

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

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

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

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

General Contractor's Authorized Signature

Typed Name and Title

SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Basketball equipment.
 - 2. Volleyball equipment.
 - 3. Safety pads.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installation of floor insert sleeves to be cast in concrete slabs and footings.
 - 2. Section 096466 "Wood Athletic Flooring" for game lines and markers.
 - 3. Section 116653 "Gymnasium Dividers."

1.3 DEFINITIONS

- A. NCAA: The National Collegiate Athletic Association.
- B. NFHS: National Federation of State High School Associations.
- C. USAV: USA Volleyball.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
 - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: For gymnasium equipment.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
 - 3. Include transport and storage accessories for removable equipment.
- C. Samples: For each exposed product and for each item and color specified.
- D. Samples for Initial Selection: For each type of gymnasium equipment.
- E. Samples for Verification: For the following products:
 - 1. Pad Fabric: Wall padding not less than 3 inches (76 mm) square, and corner and column Samples not less than 3 inches (76 mm) long, with specified treatments applied. Mark face of material.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- B. Qualification Data: For Installer.
- C. Product Certificates: For each type of gymnasium equipment.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

1.9 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension-system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Basketball backboard failures including glass breakage.
 - b. Faulty operation of basketball backstops.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 MANUFACTURERS, GENERAL**

- A. Source Limitations: Obtain gymnasium equipment from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.3 BASKETBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in NFHS's "NFHS Basketball Rules Book."
- B. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- C. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- D. Overhead-Supported Backstops:
 - 1. Folding Type: Provide manufacturer's standard assembly for forward-folding, front-braced backstop, with hardware and fittings to permit folding.
 - 2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Center-Mast Frame: Welded with side sway bracing.
 - b. Finish: Manufacturer's standard polyester powder-coat finish.
 - 3. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
- E. Main Court Basketball Backboards (2 each):
 - 1. Shape and Size:
 - a. Rectangular.
 - 2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: Not less than 1/2-inch- (13-mm-) thick, transparent tempered glass complying with ASTM C 1048 Kind FT (fully tempered) and with impact testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded-aluminum frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backboard support framing.
 - 1) Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backstop at standard mounting centers. Provide center-strut frame reinforcement.
 - 2) Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
- F. Side Court Basketball Backboards (4 each):
 - 1. Shape and Size:

- a. Rectangular.
- b. Steel: Single-piece, steel face sheet, not less than 0.1046-inch (2.7-mm) nominal thickness, with 1-1/2-inch- (38-mm-) deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backboard support framing at standard mounting centers.
- 2. Target Area and Border Markings: Marked in pattern, stripe width, and color according to referenced rules.
- 3. Finish: Manufacturer's standard factory-applied, white background.
- G. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern 5 inches (127 mm) o.c. horizontally and vertically that is manufacturer's standard for goal attachment.
 - 1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
 - 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard, and rigidity and stability of goal are maximized.
- H. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
 - 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
 - 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
 - 3. Breakaway Characteristics: Positive-lock movable breakaway design, with manufacturer's standard breakaway mechanism including preset pressure release, set to release at 230-lb (105-kg) load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 - 4. Field Adjustment: Provide rim that is field-adjustable for rebound elasticity without being removed from the backboard.
 - 5. Net Attachment: No-tie loops for attaching net to rim without tying.
 - 6. Finish: Manufacturer's standard finish.
- I. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit rim diameter, and as follows:
 - 1. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.
- J. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
 - 1. Attachment: Manufacturer's standard.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.4 **VOLLEYBALL EQUIPMENT**

- A. General: Provide equipment complying with requirements in NFHS's "NFHS Volleyball Rules Book."
- B. Floor Insert: Solid-brass floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than 9 inches (228 mm) long to securely anchor pipe sleeve in structural floor below finished floor in concrete footing as indicated; with anchors designed for securing floor insert to floor substrate indicated; one per post standard quantity as indicated.
 - 1. Floor Plate: Self-locking, hinged access cover, designed to be flush with adjacent flooring. Provide two tool(s) for unlocking access covers.
- C. Post Standards: Removable, paired volleyball post standards as indicated. Fixed height. Designed for easy removal from permanently placed floor insert supports. Fabricated from manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
 - 1. Nominal Pipe or Tubing Diameter: 3-inch (76-mm) OD at base.
 - 2. Net Height Adjuster: Manufacturer's standard mechanism for height adjustment, complete with fittings; designed for positioning net at heights indicated.
 - a. Net Heights: Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches (910 and 2430 mm) or more.
- D. Net: 32 feet (9.75 m) long; one per pair of paired post standards; and as follows:
 - 1. Width and Mesh: Competition volleyball net, 36 inches (910 mm) with 4-inch- (102-mm-) square knotless mesh made of black nylon string.

- a. Hem Band Edges: White, not less than 2-inch- (50-mm-) wide top, bottom, and side bindings; tie offs at top, bottom, and midpoint of each side end of net; end sleeves for dowels; and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post standard spacing indicated on Drawings.
 - 1) Top Line: Not less than 1/4-inch- (6-mm-) diameter rope.
 - 2) Bottom Line: Not less than 1/4-inch- (6-mm-) diameter rope.
2. Dowels: Not less than 1/2-inch- (13-mm-) diameter fiberglass or 1-inch- (25-mm-) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
3. Boundary Tape Markers: 2-inch- (50-mm-) wide white strip, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.
- E. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip worm-gear manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- F. Bottom Net Lock Tightener: Provide manufacturer's standard quick-release-type tension strap; a spring-loaded, self-locking tensioner; a turnbuckle; a pulley; or other device and linkage fittings designed to quickly and easily tighten bottom line or net.
- G. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch- (910-mm-) wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

2.5 SAFETY PADS

- A. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.
- B. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated, and lined with fire-retardant liner.
- C. Wall and Column Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick fire-retardant-treated plywood according to AWPA U1, UCFA Fire Retardant Interior.
 2. Fill: Multiple-impact-resistant foam not less than 1-1/2-inch- (38-mm-) thick polyurethane, 3.5-lb/cu. ft. (56-kg/cu. m) density.
 3. Size: Each panel section, as indicated.
 4. Number of Modular Panel Sections: As indicated.
 5. Installation Method: Concealed mounting Z-clips.
 6. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for one color(s).
 7. Graphics: Provide custom graphics in location indicated on Drawings.
- D. Corner Wall Safety Pads: Wall corner pad with top return (minimum 6") consisting of minimum 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to wall.
 1. Length: Each pad as indicated on Drawings.
 2. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for one color.
 3. Location: At stage as indicated on Drawings.

2.6 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type indicated.
 1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 2. Cast Aluminum: ASTM B 179.
 3. Flat Sheet: ASTM B 209 (ASTM B 209M).
- B. Steel: Comply with the following:
 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2. Steel Tubing: ASTM A 500/A 500M or ASTM A 513, cold formed.
3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: Manufacturer's standard galvanized-stranded-steel wire rope with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with wire rope manufacturer's written instructions for size, number, and installation method.
- D. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangers.
- E. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil chain or other grade recommended by gymnasium equipment manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.
- F. Castings and Hangers: Malleable iron, complying with ASTM A 47/A 47M; grade required for structural loading.
- G. Softwood Plywood: DOC PS 1, exterior.
- H. Particleboard: ANSI A208.1.
- I. Equipment Wall-Mounted Board: Wood, transparent finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written instructions.
- J. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- K. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C 1107/C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
 1. Verify critical dimensions.
 2. Examine supporting structure, subgrades, subfloors, and footings below finished floor.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, are completed.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 1. Floor Insert Location: Coordinate location with application of game lines and markers, and core drill floor for inserts after game lines are applied.
 2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and floor-plate type.
 3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Floor Insert Setting: Position sleeve in oversized, recessed voids in concrete slabs and footings. Clean voids of debris. Fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor and footing from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.
- E. Wall Safety Pads: Mount with bottom edge at dimension indicated on Drawings above finished floor.
- F. Safety Pads Cut-out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.
- G. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.

- H. Connections: Connect electric operators to building electrical system.
- I. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration is approved by Architect, and store units in location indicated on Drawings.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

SECTION 011000 – SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Work covered by Contract Documents.
 - 2. Access to site.
 - 3. Work restrictions.
 - 4. Specification and drawing conventions.
 - 5. Miscellaneous provisions.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

- A. Project Identification: Verbena High School Gymnasium
 - 1. Project Location: 202 County Road 510, Verbena, Alabama.
- B. Owner: Chilton County Board of Education.
 - 1. Owner's Representative: Mr. Billy Wyatt 205-280-3000
- C. Architect: Ward Scott Morris Architecture, Inc. Tuscaloosa, Alabama.
 - 1. 1606 Paul Bryant Drive, Tuscaloosa, AL 35401, 205-345-6110

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Constructing a new gymnasium and plaza, along with an expanded parking lot. Additionally, a new ticket booth and a combined restroom and concession building will be constructed to serve the baseball and foot-ball facilities.

1.4 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site within the designated construction limits for construction operations during construction period. Contractor's use of Project site is limited only by Owner's building operations outside the project limits.

1.5 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- C. Controlled Substances:
 - 1. Use of tobacco products on Project site is not permitted.
 - 2. Use of other controlled substances on Project site is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
- D. **Conformance Set, status of:**
1. **The Conformance Set is issued at the discretion of the Architect and does not supplant the documents as bid.**
 2. **When issued, the Conformance Set represents the Bid Set and all Addenda issued up to the bid date of the project and is solely for the convenience of the project team. If there are any discrepancies in this set as compared to the Bid Set and issued Addenda, the Bid Set and Addenda take precedence.**
 3. **As such, prior to use of the Conforming Set for construction activities, the Contractor shall review the set for accuracy.**

1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
 2. Provide for delivery of Owner-furnished products to Project site.
 3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
 4. Obtain manufacturer's inspections, service, and warranties.
 5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
 4. Make building services connections for Owner-furnished products.
 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
 6. Repair or replace Owner-furnished products damaged following receipt.

1.8 ORDER OF PRECEDENCE:

- A. Change Orders
- B. Addenda
- C. Supplemental general conditions and special conditions (if included)
- D. Contract
- E. Specifications
- F. Large Scale Drawings
- G. Enlarged Plans
- H. Plans
- I. Instructions to Bidders
- J. Advertisement for bids
- K. Proposal (Bid)

1.9 LIQUIDATED DAMAGES:

- A. Liquidated Damages: The agreement will include a stipulation that Liquidated Damages will be established in the following amount of dollars per calendar day for each calendar day after the completion date that the work is not fully completed and a Certificate of Substantial Completion executed.
1. \$500.00 per calendar day.

1.10 CONSTRUCTION SCHEDULE:

- A. The Agreement will include a stipulation that the work shall be completed, the Contractor's equipment removed from the Site and all work required by Section 01770 Closeout Procedures be completed according to the following schedule:
1. Pre-Bid Conference: **January 27, 2026 at 10:30 am**
 - a. Location: All Bidders are invited to attend a non-mandatory pre-bid conference to be held electronically via Zoom at 10:30 A.M. on January 27, 2026. Participants can join the video presentation by going to **<https://zoom.us/join>** or via conference call at +1(312) 626-6799. Please enter the **Meeting ID#: 869 6486 6446 & Passcode: 590509** at the website and on the conference call when prompted.
 2. Receipt of Bids: **February 10, 2026 at 2:00 pm**
 - a. Location: **Chilton County Board of Education, 1705 Lay Dam Road, Clanton, AL**
 3. Contract Award / LOI to Begin Submittals & Sales Tax Exemption: TBD
 4. DCM Pre-Construction Conference / Begin work on site: TBD
 5. Substantial Completion: TBD (Tentative)
 6. Construction Duration: **390** Total Calendar Days

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.10 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.11 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of testing and inspection services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.12 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 - 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.

2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Schedule of Allowances

1. Allowance No. 1 – Removal / Offsite Disposal / Replacement of Unsuitable Material (Quantity Allowance – Base Bid) (Unit Price #1):
 - a. Includes 1,350 cubic yards in place, to be include in the base bid, of Removal / Offsite Disposal / Replacement of Unsuitable Material. Payment for “Removal / Offsite Disposal/ Replacement of Unsuitable Material” shall be made at the unit price bid, per cubic yard in place (CYIP) removed, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. Payment for this item will include Removal of Unsuitable Material, if encountered, as directed by the Geotechnical Representative in areas underneath the proposed asphalt parking, sidewalks, buildings, fence columns, etc. This includes unsuitable excavation/removal, offsite disposal of the material, and replacement with approved offsite borrow material to return the ground back to its original elevation. Haul tickets shall not be considered a valid determination of quantities. In cut sections, following topsoil stripping, the Contractor shall grade the area to finished subgrade and verify he is at the proper elevations before the Owner's Representative shall review the area for any unsuitable materials requiring removal. In fill sections, the Contractor shall remove topsoil, debris, etc. and identify the area as a fill section before the Owner's Representative shall review the area for any unsuitable materials requiring removal. Following topsoil stripping and excavation to subgrade, the Contractor shall notify the Owner's Representative twenty-four (24) hours before any unsuitable material is excavated, so the area of unsuitable material may be delineated and removed as directed by the Owner's Representative. Any unsuitable material shall be hauled offsite and disposed of. Following the removal of unsuitable material, the Contractor shall again notify the Owner's Representative before any offsite replacement material is placed so the area may be measured for removal depths by Owner's Representative to derive the cubic yards of unsuitable removal. Failure to notify the Owner's Representative and performing unsuitable excavation without their presence for measurement shall forfeit payment of that amount of unobserved work. Following measurement of depth, the Contractor shall replace the unsuitable material with approved fill material as required by the Geotechnical Report to the required elevation grades. The Contractor shall note that any areas originally determined to be suitable but overtime result in unsuitable areas as a result of their failure to properly maintain the site, drain it properly, etc. will not be paid for as part of this allowance but shall be removed/replaced at no additional cost to the project.
 - b. It is possible that upon completion of the project that this allowance may not have been used. Should this quantity be increased or decreased by direction from the Owner's Representative, any adjustments to the contract amount for this item will be based on the unit cost provided as Unit Price No. 1 in the Unit Price Specification Section.
2. **Allowance No. 2 – Removal / Condition / Reuse of Unsuitable Material (Quantity Allowance – Base Bid):**
 - a. Includes **400 cubic yards in place**, to be include in the base bid, of Removal / Condition / Reuse of Unsuitable Material. Payment for “Removal / Condition / Reuse of Unsuitable Material” shall be made at the unit price bid, per cubic yard in place (CYIP) removed, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. Payment for this item will include Removal of Unsuitable Material, if encountered, as directed by the Geotechnical Representative in areas underneath the proposed asphalt parking, sidewalks, buildings, fence columns, etc. This includes unsuitable excavation/removal, onsite stock pile and conditioning of the material, and reusing the material to return the ground back to its original elevation. Conditioning may include tasks such as spreading, drying, discing, etc. to make the soil useable as approved fill material. Haul tickets shall not be considered a valid determination of quantities. In cut sections, following topsoil stripping, the Contractor shall grade the area to finished subgrade and verify he is at the proper elevations before the Owner's

Representative shall review the area for any unsuitable materials requiring removal. In fill sections, the Contractor shall remove topsoil, debris, etc. and identify the area as a fill section before the and removed as directed by the Owner's Representative. Following the removal of unsuitable material, the Contractor shall again notify the Owner's Representative before any reused material is placed so the area may be measured for removal depths by Owner's Representative to derive the cubic yards of unsuitable removal. Failure to notify the Owner's Representative and performing unsuitable excavation without their presence for measurement shall forfeit payment of that amount of unobserved work. Following measurement of depth Owner's Representative shall review the area for any unsuitable materials requiring removal. Following topsoil stripping and excavation to subgrade, the Contractor shall notify the Owner's Representative twenty-four (24) hours before any unsuitable material is excavated, so the area of unsuitable material may be delineated, the Contractor shall replace the unsuitable material with approved fill material as required by the Geotechnical Report to the required elevation grades. The Contractor shall note that any areas originally determined to be suitable but overtime result in unsuitable areas as a result of their failure to properly maintain the site, drain it properly, etc. will not be paid for as part of this allowance but shall be removed/replaced at no additional cost to the project.

- b. It is possible that upon completion of the project that this allowance may not have been used. Should this quantity be increased or decreased by direction from the Owner's Representative, any adjustments to the contract amount for this item will be based on the unit cost provided as **Unit Price No. 2** in the Unit Price Specification Section.

3. **Allowance No. 3 – Asphalt Patching (6.5" Compacted Thickness)** (Quantity Allowance – Base Bid):

- a. Includes **200 square yards**, to be included in the base bid, of Asphalt Patching (6.5" Compacted Thickness). Payment for "Asphalt Patching (6.5" Compacted Thickness)" shall be made at the unit price bid, per square yards of specified mix, and shall be compensation in full for furnishing all materials, equipment, tools, labor, and incidentals necessary to complete the work. This pay item also includes 12" ALDOT No. 825B crushed stone base. It also includes saw cutting and removal of existing failed pavement and subgrade material necessary to install the deep patch. It also includes the installation of the 1" wearing surface and any associated milling for its installation. This pay item shall be used only when specified by the Owner's Representative. Installation of Asphalt Patching without the prior approval of the Owner's Representative shall forfeit payment of that amount of unapproved work.
- b. It is possible that upon completion of the project this allowance may not have been used. Should this quantity be increased or decreased by direction from the Owner's Representative, any adjustments to the contract amount for this item will be based on the unit cost provided as **Unit Price No. 3** in the Schedule of Unit Prices.

4. **Allowance No. 04 – Crushed Aggregate Base Course, ALDOT Section 825, Type B** (Quantity Allowance – Base Bid):

- a. Includes **1,370 square yards**, to be included in the base bid, of Crushed Aggregate Base Course, ALDOT Section 825, Type B. Payment for "Crushed Aggregate Base Course, ALDOT Section 825, Type B" shall be made at the unit price bid, per Square Yard Compacted In Place, and shall be compensation in full for furnishing all materials, equipment, tools, labor, and incidentals necessary to complete the work. Crushed Aggregate Base Course, Type B (6" Thick), also referred to as base material, shall be as defined in section 825 of the ALDOT Standard Specifications for Highway Construction, Latest Edition. Square Yards will be calculated by multiplying the length and width of the placed material. Only placed and compacted materials will be paid for. Haul tickets shall not be considered a valid determination of base material. Base material shall be placed per the typical sections or as directed by the Engineer. The intent of this item is for final gravel road surface improvements in areas that arise during the course of construction beyond those shown in the construction plans. This item includes removal and disposal of damaged gravel surface (if necessary) and replacement with Crushed Aggregate Base Course, ALDOT Section 825, Type B (6" thick). This item shall not be used in lieu of temporary stones needed to maintain serviceability to the school, school facilities, and local residences, or areas damaged due to carelessness by the contractor. Installation of Crushed Aggregate Base Course without the prior approval of the Owner's Representative shall forfeit payment of that amount of unapproved work.
- b. It is possible that upon completion of the project this allowance may not have been used. Should this quantity be increased or decreased by direction from the Owner's Representative, any adjustments to the contract amount for this item will be based on the unit cost provided as **Unit Price No. 04** in the Schedule of Unit Prices.

5. **Allowance No. 05 – Slurry Fill of Abandoned Pipes** (Quantity Allowance – Base Bid):

- a. Includes **100 cubic feet**, to be included of the base bid, of Slurry Fill of Abandoned Pipes. Payment for "Slurry Fill of Abandoned Pipes" shall be made at the unit price bid, cubic yard, and shall be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. No extra payment will be made for plugs, bulkheads, opening the pipe at sufficient intervals to install the slurry fill and to release air, pavement patches in areas not designated to be patched on the Drawings, surface restoration including providing and installing pavement replacement materials, topsoil, seed and sod, special equipment or cleanup work, but costs for these items shall be included in the pay item for Slurry Fill of Abandoned Pipes. Haul tickets shall be collected the day of delivery and logged for payment.

Failure to provide haul tickets for that day's cubic yards hauled will forfeit payment for that amount placed. Miscellaneous haul tickets turned in randomly at the end of the month for payment shall be ignored. Slurry fill shall be 150 psi minimum.

- b. It is possible that upon completion of the project this allowance may not have been used. Should this quantity be increased or decreased by direction from the Owner's Representative, any adjustments to the contract amount for this item will be based on the unit cost provided as **Unit Price No. 05** in the Schedule of Unit Prices.
6. Allowance No. 6: Reinforcing Steel. (Unit Price #2)
 - a. Quantity Allowance: Include an allowance of **2.0 tons** of reinforcing steel in place in addition to the steel shown on the contract documents. This steel is to be placed in sizes and locations at the direction of the Owner, Architect, Engineer, or the Construction Manager.
7. Allowance No. 7: Structural Concrete in place (Unit Price #3)
 - a. Quantity Allowance: Include in base bid, **50 cu. yd.** of concrete for spread footings in place to support PEMB frames/bents foundations. Contractor to provide an in-place unit price for reinforcing steel and concrete spread footings based on these quantities. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."
8. Allowance No. 8: Structural Steel.
 - a. Quantity Allowance: Include in base bid, **1.5 tons** structural steel in place in addition to the steel shown on the contract documents. This steel is to be placed in sizes and locations at the direction of the Owner, Architect, Engineer, or the Construction Manager.
9. Allowance No. 9: Masonry
 - a. Quantity Allowance: Include an allowance of \$600 per thousand for face brick.
 - b. Quantity Allowance: Include an allowance of \$20 per bag for pigmented mortar.
10. Allowance No. 10: Interior & Exterior Graphics
 - a. Lump Sum Allowance: Include an allowance of \$40,000.00 for the purchase and installation of interior and exterior surface-applied graphics as instructed by the Owner, Architect, or Construction Manager.
11. Allowance No. 11: Gym – Audio Visual Equipment (including Scorer's Table, Digital Scoreboards, & Shot Clocks)
 - a. Lump Sum Allowance: Include an allowance of **\$250,000.00** for the purchase and installation of audio-visual equipment, scorer's table and digital scoreboards for the Gym as instructed by the Owner, Architect, or Construction Mgr. **Contractor still responsible for raceways and power in scope outside of allowance.**
12. Allowance No. 12: Display Cases & Custom Wood Lockers.
 - a. Lump Sum Allowance: Include an allowance of **\$100,000.00** for the purchase and installation of display cases as instructed by the Owner, Architect, or Construction Manager.
13. Allowance No. 13: BDA System
 - a. Contingency Allowance: Include a Lump Sum Allowance of **\$15,000.00** to cover any additional requirements to the BDA system beyond the scope as described on electrical drawings and specifications.
14. Allowance No. 12: Project Contingency
 - a. Contingency Allowance: Include a contingency allowance of **\$200,000.00** for use as instructed by the Owner or Architect.

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for procedures for using unit prices to adjust quantity allowances.
 - 2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 3. Section 014000 "Quality Requirements" for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, [applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No. 1: Unsuitable Soils
 - 1. Undercutting unsuitable soils, disposing of material off site, and replacing with offsite borrow structural fill compacted in place.

Unit Price per Cubic Yard In Place \$ _____

- B. Unit Price No. 2: Reinforcing Steel
 - 1. Reinforcing steel in place and installed as directed by the Owner, Architect, Engineer or the Construction Manager.

Unit Price per Ton in Place \$ _____

- C. Unit Price No. 3: Concrete
 - 1. 3000 psi Concrete in place and installed as directed by the Owner, Architect, Engineer or the Construction Manager.

Unit Price per Cubic Yard in Place \$ _____

D. Unit Price No. 4: BDA System

1. The BDA systems shall bid as follows:
 - a. Base Bid: Initial Survey of Building as described in specification section 285000
2. Unit Price: Installation and testing of the BDA system as per plans and specification section 285001

END OF SECTION 012200

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 1. Section 012100 "Allowances" for products selected under an allowance.
 2. Section 012300 "Alternates" for products selected under an alternate.
 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Substitution Request Form: Use **CSI Form 13.1A**.
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of

construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
- b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.
- c. During the bid period, any substitution requests shall be made at least 48 hours prior to bid opening with architect notification of approval or disapproval to occur at least 24 hours prior to bid opening.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not adversely affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional re-

sponsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on form included in Project Manual.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Construction Manager are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on form included in Project Manual.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on form included in Project Manual. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 1 Section "Allowances" for procedural requirements governing handling and processing of allowances.
 - 2. Division 1 Section "Unit Prices" for administrative requirements governing use of unit prices.
 - 3. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - 2. Submit the Schedule of Values to Architect through Construction Manager at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Description of the Work.
 - b. Change Orders (numbers) that affect value.
 - c. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

6. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for submitting payment application to the Construction Manager is 25th day of each month. The period covered by each Application for Payment starts on the 16th day of each month and ends on the 15th day of the following month. Payment applications received after the 25th day of the month will be held for action after the next payment period.
- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- D. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt by stipulated date above.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
- F. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- G. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 3. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 4. AIA Document G707, "Consent of Surety to Final Payment."
 5. Evidence that claims have been settled.
 6. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 012910 - SALES AND USE TAX SAVINGS

1.1 STATE REGULATIONS FOR SALES AND USE TAX SAVINGS

- A. Pursuant to Title 40 (Revenue and Taxation), Code of Alabama 1975, the gross proceeds of the sales of tangible personal property to the State of Alabama, counties and incorporated municipalities, county and city school boards, independent school boards, and all educational institutions and agencies of the state, counties, and municipalities are exempt from sales and use taxes. Such entities may exercise their tax exempt status and save the costs of sales and use taxes to be paid on tangible personal property incorporated into their building construction and improvement projects. "Tangible personal property" will be referred to in these guidelines as "materials" and include materials, supplies, equipment, and other items necessary for the performance of building construction or improvement work by a contractor and its subcontractors.
- B. Legislative Act 2013-205 and Alabama Department of Revenue Rule 810-6-3-.77 enable each contractor and subcontractor to purchase said building materials, construction materials and supplies, and other tangible personal property pursuant to a qualifying contract entered into on or after January 1, 2014. The Alabama Department of Revenue will assign each contractor and subcontractor a consumers use tax account, if one is currently not in place, at the time the Form STC-1, *Sales and Use Tax Certificate of Exemption for Government Entity Projects*, is issued. Tax savings arrangements should be implemented with the award of the construction contract; attempts to effect tax savings after materials have been ordered and delivered in the contractor's name or paid for by the contractor will not be honored by the Alabama Department of Revenue.
- C. CRITERIA OF EXEMPTION: To effect tax exempt purchases through a construction contract the following criteria must be met:
 1. The contractor must complete and receive approval of Form STC-EXC01 and receive a consumers use tax account in order to purchase materials on the owner's behalf.
 - a. This form shall be completed and approved by the Alabama Department of Revenue on a PER PROJECT basis.
 2. The contractor and all subcontractors must file monthly consumers use reports at <http://myalabamataxes.alabama.gov>.

1.2 GENERAL INTENT AND REQUIREMENTS

- A. PURPOSE: The Owner is a Tax Exempt Instrumentality of the State of Alabama. As such, it is authorized to delegate through the use of Alabama Department of Revenue Form STC-1, the Contractor to purchase all, or a portion of, the materials, supplies, equipment, and other items (hereinafter referred to as "materials") necessary for the performance of this Contract by the Contractor and its subcontractors and thereby save the amount of the sales and use tax thereon.
- B. SALES AND USE TAXES ARE NOT INCLUDED IN THE CONTRACT AMOUNT: The Base Bid (and all Alternate Bids) submitted on the proposal form WILL NOT INCLUDE the cost of required taxes, including sales and use taxes; therefore, sales and use taxes will not be included in the Contract amount.
- C. The contractor must include ABC Form C-3A Accounting of Sales Tax Attachment with their proposal. Failure to provide this form will render the bid non-responsive.

1.3 CERTIFICATE OF EXEMPTION

- A. To establish the agency relationship between the Contractor and Owner for the purposes of this Section, both parties will execute Certificates of Exemption upon execution of the Construction Contract and after the Contract Bonds and Contract have been properly executed and approved. The form of Agency Agreement to be utilized is bound at the end of this Section.
- B. **The contractor must provide a copy of the contract and a list of subcontractors to the Department of Revenue, Sales and Use Tax Division with Form STC-EXC01.**

1.4 GENERAL PROVISIONS

- A. PRECEDENCE: The provisions of this Section take precedence over the printed forms, "Instructions to Bidders", "General Conditions of the Contract", as modified and "Supplementary General Conditions". Unaltered provisions of these documents remain intact.
- B. BID PROPOSALS: The Contractor shall submit its proposal for Base Bid and proposals for each Alternate Bid, if any, excluding all required sales and use taxes.
- C. NOTICE OF INTENT: The Contractor, its subcontractors, sub-subcontractors, and all material suppliers are hereby made aware of the Owner's intent to reduce the Contract amount through the purchase of materials in the manner hereinafter described and the Contractor shall not arbitrarily withhold his consent to the arrangement.
- D. ADMINISTRATION: Purchases and the resulting sales and use tax savings affected pursuant to this Section will be administered by the Contractor in accordance with the procedures set forth herein and utilizing the

presentation of Form STC-1 and accounting through <http://myalabamataxes.alabama.gov>. Under the Certificate of Exemption, the Contractor will be appointed as agent of the Owner to purchase, for and in the name of the Owner, those materials that are necessary for the performance of the Work by the Contractor and its subcontractors.

- E. CONTRACTOR' ADMINISTRATIVE COSTS: Any and all costs incurred by the Contractor's administration of purchases pursuant to the provisions of this Section shall be considered to be included in the Contract Amount. No additional costs shall be added to the Contract amount because of the service provided by the Contractor in the purchase of materials for this project in the name of the Owner.
- F. SUBCONTRACTORS AND SUPPLIERS: The Contractor shall include provisions in all subcontracts requiring subcontractors and suppliers and their sub-subcontractors and sub-suppliers to also apply for and receive Certificates of Exemption in order to effect the sales and use tax savings procedures set forth therein, fully utilizing the applicable forms bound herein.
- G. DISCOUNTS: In the event there is entitlement to a discount because of timely payments for purchases made pursuant to this Section, such discount shall be the property of the Contractor.
- H. RESPONSIBILITY FOR MATERIALS: Notwithstanding this special purchase arrangement, the Contractor shall be responsible for all materials purchased hereunder, the same as would have been the case if these tax savings procedures were not implemented. Such responsibility of the Contractor shall include, but not be limited to, selecting, describing, ordering, obtaining approvals, submitting samples, coordinating, processing, preparing shop drawings, expediting deliveries, receiving and unloading, inspecting, properly storing and protecting, insuring, and guaranteeing the materials. The Contractor shall accept and sign for the materials as the Owner's agent .
- I. WARRANTIES: The purchase of materials pursuant to this Section shall not relieve the Contractor of its obligation to provide warranties specified elsewhere in these project specifications in full force and effect, the same as if these procedures were not implemented. If the purchase of an item in accordance with these procedures will invalidate the warranty offered and/or required for that item, the Contractor shall notify the Architect and Owner of the condition prior to purchasing the item so that the Owner may evaluate its option to waive these procedures for that purchase. If materials purchased pursuant to this Section fail to meet the requirements of the plans and specifications, the Contractor, as agent of the Owner or its assigns, will be responsible to enforce and pursue, at Contractor's cost and expense, including attorneys fees, all warranty actions against vendors or others responsible for the furnishing of such defective or non-complying materials to Owner.

1.5 PROCEDURES

- A. CERTIFICATE OF EXEMPTION: The contractor or subcontractor may present form STC-1 issued by the Alabama Department of Revenue to vendors for purchases of tangible personal property without the payment of sales or use tax.
- B. PROCESSING OF INVOICES: The contractor will render payments to Vendors directly.

1.6 MONTHLY ACCOUNTING

- A. The Contractor's shall submit monthly consumers use tax returns and report all exempt purchases to The Alabama Department of Revenue through <http://myalabamataxes.alabama.gov>.



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

ST: EXC-01
11/23

Application For
Sales and Use Tax Certificate of Exemption

FOR GOVERNMENT ENTITY PROJECT

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

PROJECT INFORMATION:

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

APPLICANT'S INFORMATION:

RELATION: (CHOOSE ONE)
Government Entity Statutorily Exempt Entity General Contractor Subcontractor
APPLICANT'S LEGAL NAME FEIN
DBA CONSUMER'S USE TAX ACCOUNT NUMBER
MAILING ADDRESS: STREET CITY STATE ZIP COUNTY
CONTACT PERSON BUSINESS TELEPHONE NUMBER
EMAIL ADDRESS

PROJECT START DATE PROJECT END DATE
WILL THE APPLICANT HAVE ANY SUBCONTRACTORS ON THIS JOB?
Yes No If yes, please attach list.
NAME OF PARTY TO THE CONTRACT

JOB DESCRIPTION

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE?
Yes No
ESTIMATED POLLUTION CONTROL COST
\$

TOTAL PROJECT BID AMOUNT (APPLICANT'S PORTION OF PROJECT) LABOR COST (APPLICANT'S PORTION OF PROJECT) MATERIAL COST (APPLICANT'S PORTION OF PROJECT)
\$ \$ \$

REVENUE DEPARTMENT USE ONLY

PENDING DOCUMENTATION / INFORMATION:
GCL SBL Contract / NTP / LOI LOS Project Dates / Breakdown of Costs

Contact Dates: Received Date:

Forwarded for Denial:

PROJECT NAME

PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

Individual Partnership Corporation Multi member LLC Single member LLC Government Entity

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

OWNERSHIP INFORMATION:

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

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

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

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

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

NAME (PLEASE PRINT)

SIGNATURE

TITLE

DATE

REVENUE DEPARTMENT USE ONLY

PENDING OTHER:

Government Entity General Contractor Not on LOS

Contact Dates: _____ Received Date: _____

Forwarded for Denial: _____

Examiner's Remarks _____

Examiner _____ Date _____

Instructions For Preparation of Form ST: EXC-01

Sales and Use Tax Certificate of Exemption for Government Entity Project

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

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

Exempt Entity:

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

General Contractor:

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

Subcontractor:

1. Signed Application
2. Alabama Board of General Contractor's License
3. State/County Business License (usually obtained through county probate office)
4. List of Subcontractors (if any)

General contractors and subcontractors:

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

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

Fax: (334) 353-7867

Email: STContractorsExempt@revenue.alabama.gov

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

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
 - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.

1.5 PROJECT MEETINGS

- A. General: Contractor will schedule and conduct meetings and conferences at Project site, unless otherwise indicated. The Contractor will:
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within [3] <Insert number> days of the meeting.
- B. Preconstruction Conference: Contractor will schedule a preconstruction conference before starting construction, at a time convenient to Owner, and Architect, but no later than 10 days after execution of the Agreement. The conference will be held at Project site or another convenient location. Contractor will conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.

- I. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements.
 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Contractor will conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
 3. Reporting: Contractor will distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - a. Include Phasing
 - 2. Site condition reports.
 - 3. Special reports.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
 - 2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
- D. Site Condition Reports: Submit at time of discovery of differing conditions.
- E. Special Reports: Submit at time of unusual event.
- F. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

- B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 3. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 - 5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Partial occupancy before Substantial Completion.
 - b. Seasonal variations.
 - c. Environmental control.
 - 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Submittals.
 - b. Mockups.
 - c. Fabrication.
 - d. Installation.
 - e. Tests and inspections.
 - f. Adjusting.
 - g. Curing.
 - h. Startup and placement into final use and operation.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- D. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice of Award.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- B. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Utility interruptions.
 - d. Installation.
 - e. Testing and commissioning.
 - f. Punch list and final completion.
 - g. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of **5** percent of the Contract Sum.
 - a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- C. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- D. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the schedule of values).
- E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- F. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.

2.3 SPECIAL REPORTS

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
 - 2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
 - 3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule and construction photographs.
 - 4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
 - 5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS

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

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architects' receipt of submittal.
 - 1. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 7 days for initial review of each submittal.
 - 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect and Construction Manager. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
 - 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 5. Allow 7 days for processing each resubmittal.
 - 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 4 by 5 inches (100 by 125 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 - j. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Number of Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 2. Architect will review submittal, and if appropriate, will forward to Consultant for review.
 3. When submittal review is complete by Architect, and Consultant when appropriate, Architect will return marked submittals to the Contractor.
 4. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Use AIA Document G810 or CSI Form 12.1A.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 1. Number of Copies: Submit three copies of each submittal, plus the number of copies that need to be returned to Contractor. Contractor must retain one returned copy as a Project Record Document and one returned copy where copies are required for operation and maintenance manuals.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.

- f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operating and maintenance manuals.
 - k. Compliance with recognized trade association standards.
 - l. Compliance with recognized testing agency standards.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 6. Number of Samples for Verification: Submit one set of Samples. Architect will retain Sample set.
 - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

7. Disposition: Contractor will maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- G. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."
- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit three copies of each submittal, plus the number of copies that need to be returned to Contractor.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures Operation and Maintenance Data."

- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect [or Construction Manager].
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.

9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and re-inspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made directly from Owner.
 3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

- a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
 1. Testing agency will notify Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, with copy to Contractor and to authorities having jurisdiction.
 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Testing agency will retest and reinspect corrected work.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

STATEMENT OF SPECIAL INSPECTIONS

Project:
Project Address:
Permit Applicant:
Applicant Address:
Owner:
Owner Address:

Registered Design Professionals (RDP):

Architect:
Geotechnical Engineer:
Structural Engineer:
Mechanical Engineer:
Electrical Engineer:

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than_____.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Acknowledgement:

Signature _____ Date _____

Building Official's Acceptance:

Signature _____ Date _____

Permit No. _____

Frequency of interim report submittals to building official:

Monthly Bi-Monthly Upon Completion Per Attached Schedule

RDP in Responsible Charge



SCHEDULE OF SPECIAL INSPECTIONS

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
1000.00	General Conditions			
1000.01	Review of Structural Documents and Shop Drawings to determine differences not approved by Architect or Engineer of Record	Continuous	Structural Documents should take precedence over any shop drawings. Special Inspector should use the Architectural and Structural Documents as the primary documents for review of construction. Shop drawing should be used as secondary document to review details not shown on the Architectural and Structural Documents. Any discrepancy between the two documents should be resolved by the Architect or Engineer of Record before proceeding with construction.	1
1000.02	The Special Inspector duties for missing details, conflicting details or coordination issues.	Continuous	Reasonable attempts have been made on the part of the design team to properly coordinate drawings. However in the event that a question arises on the project the Special Inspector shall obtain clarification from the Architect on all items. No changes shall be made to the drawings or construction without written conformation.	1
1400.00	Fabricators			
1400.01	Review the quality control procedures of the following fabricators for completeness and adequacy relative to the fabricator's scope of work: steel fabricator and wood truss fabricator.	Periodic		1

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
1400.02	The following fabricators, if registered and approved by the building official, may submit "Certificates of Compliance" at the completion of their scope of work that their fabricated items were constructed in accordance with the approved construction documents: steel fabricator and wood truss fabricator. Fabricators having successfully completed no fewer than 5 similar projects may also submit for approval with documentation of similar projects.	Periodic		1
2300.00	Soils and Deep Foundations			
2300.01	Verify bearing capacities of soils beneath footings.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	2
2300.02	Verify site preparation prior to beginning fill placement. Verify fill material type, placement method, lift thickness, and compaction of fill material. Verify in-place density of compacted fill.	Periodic	As recommended in approved soils report and specified in earthwork specifications.	2
3300.00	Concrete Construction			
3300.01	Slabs on grade are excepted from the inspections listed below.			1
3300.02	Inspect concrete formwork except as noted above for proper dimensions. Verify that construction joints are properly keyed. Verify that slab recesses, if any, have been installed.	Periodic	Prior to each pour.	1
3300.03	Inspect reinforcing steel except as noted above for installation including size, spacing and bar clearances. Verify that lap splices and embedment lengths are per the construction documents. Verify that dowels for work above are properly aligned and spaced to match other work.	Periodic	Prior to each pour.	1
3300.04	Verify each proposed concrete mix for the project.	Periodic	For each proposed mix.	1
3300.05	Sample all concrete for strength tests and test concrete for slump, air content, temperature, and other tests.	Continuous	During placement operations. Reference concrete specifications for specific tests and frequencies.	2
3300.06	Inspect concrete placement except as noted above.	Continuous		1
3300.07	Inspect all concrete curing operations as noted in the extents column.	Periodic	Monitor during hot, cold and windy conditions. Reference concrete specifications.	1
3300.08	Verification of in-situ concrete strength prior to removal of forms and shores supporting weight of concrete.	Periodic	Prior to form or shoring removal.	1

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
3300.09	Verify sawed joints in slabs on grade are completed within 4 hours of final set of the concrete.	Continuous		1
4810.00	Masonry Construction			
4810.01	Masonry foundation walls are excluded from inspections listed below.			1
4810.02	Inspect masonry cells and cleanouts prior to placement of grout. Inspect grout proportions. Inspect placement of reinforcement.	Periodic	Prior to grouting of masonry.	1
4810.03	Inspect grouting operations to ensure compliance with code and construction documents.	Continuous	During grouting.	1
4810.04	Inspect proportions of site prepared mortar and grout. Inspect placement of masonry units and construction of mortar joints. Inspect reinforcement for correct size and spacing. Inspect work for correct size and location of structural elements.	Periodic	At beginning of masonry construction and every 500 square feet of masonry thereafter.	1
4810.05	Inspect masonry cells and cleanouts prior to placement of grout. Inspect placement of all grout.	Continuous	During grouting.	1
4810.06	Inspect type, size, and location of anchors, including details of anchorage of masonry to structural members, frames or other construction.	Continuous	During installation of anchors. Including adhesive anchors and hole preparation/ cleaning.	1
4810.07	Inspect protection of masonry during cold weather and hot weather.	Periodic	During periods with temperatures below 40 degrees or above 90 degrees.	1
4810.08	Inspect preparation of grout specimens, mortar specimens and / or prisms.	Continuous	During preparation of all specimens.	1
4810.09	Verify compliance with all required inspection provisions of the construction documents and approved submittals.	Periodic	As required for duration of project.	1
5120.00	Steel Construction			
5120.01	Inspect and verify structural steel material: a. Identification markings to conform to ASTM standards specified in the approved construction documents. b. Manufacturers' certified mill test reports.	Periodic	Confirm that materials meet applicable ASTM specifications noted in construction documents.	1
5120.02	Inspect and verify weld filler materials: a. Identification markings to conform to AWS specification in the approved construction documents. b. Manufacturer's certificate of compliance required.	Periodic	Confirm that materials meet applicable ASTM specifications noted in construction documents.	1

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
5120.03	Inspect welding: Structural Steel: 1) Single-pass fillet welds $\leq 5/16$ " 2) Floor and deck welds.	Periodic	Per specifications and AWS D1.1	1
5400.00	Cold Formed Metal Framing			
5400.01	Inspect erected light gage framing including any walls and/or soffits. This includes stud framing, connections, and components.	Periodic	Inspect light gage framing, components, and connections with construction documents and approved deligated design shop drawings.	1
61753.00	Shop Fabricated Wood Trusses			
61753.01	Inspect fabricated trusses and shop built components.	Periodic	Inspect truss production in shop unless fabricator is approved by building official and submits certification of compliance at end of scope of work. Inspect 30% of trusses. Inspect 100% of trusses if discrepancies are observed.	1
61753.02	Inspect site-built assemblies including site built trusses. Inspect erected trusses including bridging, bracing, and attachments.	Periodic	Inspect all site-built trusses. Inspect erected trusses and installation of bridging and bracing.	1
61753.03	Verify hold down attachments are properly installed.	Periodic	Inspect after rough carpentry is complete.	1
61753.04	Verify size and spacing of deck attachment to trusses.	Periodic	Inspect after rough carpentry is complete.	1
7000.00	Architectural / MEP Components			
7000.01	Observe anchoring of veneers to the building structure.		Inspect veneers same as other required for other masonry.	1
7000.02	Verify surface condition preparation of structural members.			1
8000.00	Special Inspections for Wind Resistance			
8000.01	Wall Connections to Roof and Floor Diaphragms and Framing	Periodic		1

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
8000.02	Roof and Floor Diaphragm Systems, including Collectors, Drag Struts, and Boundary Elements.	Periodic		1
8000.03	Vertical Windforce-Resisting Systems, including Braced Frames, Moment Frames, and Shearwalls	Periodic		1
8000.04	Windforce-Resisting System Connections to the Foundation.	Periodic		1
9000.00	Special Inspections for Seismic Resistance			
9000.01	Inspect structural welding in accordance with AISC 341.	Continuous	Exceptions: 1. Single-pass fillet welds not exceeding 5/16 inch in size. 2. Floor and roof deck welding.	1
9000.02	Certificates of compliance used in masonry construction		Prior to construction.	1
9000.03	Verify masonry <i>f'm</i> .		Prior to construction.	1
9000.04	Verification of proportions of materials in mortar and grout as delivered to the site	Periodic		1
9000.05	Review certified mill test reports of all concrete reinforcing.			1
9000.06	Visual observation of structural system by registered design professional for general conformance to approved construction documents (including addenda and approved changes) at significant stages and at completion.	Periodic		3
13341.00	Pre-Engineered Metal Structures (PEMS) - Buildings, Canopies, Signs, Etc...			
13341.01	As a code minimum, the steel field connection materials and field bolting and/or welding is to be visually inspected.	Periodic	See PEM Structure/Canopy drawings for further details and requirements.	1

INSPECTION AGENTS				
#	Firm, Address, Telephone			
1	Special Inspector			1
2	Geotechnical Consultant			2
3	Structural Engineer of Record			3
<p><i>Note: The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Inspection Agent(s)</i></p>				

Item	Inspection / Test / Certification	C or P	Extent / Comments	Agent
<i>may be subject to the approval of the Building Official.</i>				

FINAL REPORT OF SPECIAL INSPECTIONS

Project:

Project Address:

Testing / Inspection Agent:

Testing / Inspection Agent Address:

Scope of Testing / Inspections:

(To be completed by Testing / Inspection Agent)

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.

Interim reports submitted prior to this final report and numbered [] to [], form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated [] have been corrected:

(Attach 8 1/2" x 11" continuation sheet(s) if required to complete the description of corrections)

Special Inspector's Seal

Prepared By:

Type or print name

Signature

Date

(Licensed Professional Engineer)



SECTION 014100– STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.
- B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
 - 3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.
- C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.
- D. Related Sections include but are not limited to the following:
 - 1. 032000 CONCRETE REINFORCING.
 - 2. 033000 CAST-IN-PLACE CONCRETE.
 - 3. 051200 STRUCTURAL STEEL FRAMING.
 - 4. 061753 SHOP FABRICATED WOOD TRUSSES.

1.3 DEFINITIONS

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

- E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.
- F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
 - a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
 - 2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

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

1.6 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

- A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to

approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.

1. Special inspection reports and test results shall include, but not be limited to, the following:
 - a. Date of inspection.
 - b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
 - c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.
 - 1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
 - d. Name and signature of special inspector and / or testing agency representative performing the work.

- B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.

- C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.

- D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITY

- A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.

- B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.

- C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
 1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

- D. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the

building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:

1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
 2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
 3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
 2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
 3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.
- F. The contractor shall be responsible for costs of:
1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
 2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
 3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.2 STRUCTURAL OBSERVATIONS

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

3.3 TESTING AND INSPECTION

- A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.
- B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 - SCHEDULES AND FORMS (ATTACHED)

4.1 STATEMENT OF SPECIAL INSPECTIONS.

4.2 SCHEDULE OF SPECIAL INSPECTIONS.

4.3 FINAL REPORT OF SPECIAL INSPECTIONS.

END OF SECTION 01410

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": The term "approved," when used to convey Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.
- D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- E. "Regulations": 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" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, 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": An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
- J. The term "experienced," when used with an entity, means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 1. Using a term such as "carpentry" does not 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 tradespeople of the corresponding generic name.
- K. "Project site" is the space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless 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 standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
 - 3. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
 - 1. At New Construction
 - a. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.
 - b. Water Service: Pay water-service use charges for water used by all entities for construction operations.
 - c. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.
 - 2. At Existing Facilities
 - a. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
 - b. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch-(3.8-mm-)thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch-(60-mm-)OD line posts and 2-7/8-inch-(73-mm-)OD corner and pull posts, with 1-5/8-inch-(42-mm-)OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.
- B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
 3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."
- C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Maintain and touchup signs so they are legible at all times.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 1. Extent of Fence: As indicated on Drawings.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

- B. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 1 Section "Allowances" for products selected under an allowance.
 - 2. Division 1 Section "References" for applicable industry standards for products specified.
 - 3. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
 - 4. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility[, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise]. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Cost information, including a proposal of change, if any, in the Contract Sum.
 - g. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance if Contract Sum or Time is changed: Change Order.
 - b. Form of Acceptance if Contract Sum or Time is not changed: Written instruction from Architect.
 - c. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered, unless otherwise indicated.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 3. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
 4. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 5. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 6. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
 7. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product[s]" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Substitutions may be considered, unless otherwise indicated.
 8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
 9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

- a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
- b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 30 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.
 8. Requested substitution has been coordinated with other portions of the Work.
 9. Requested substitution provides specified warranty.
 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017000 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Construction Manager that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Construction Manager. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify and Construction Manager promptly.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

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

3.8 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017000

SECTION 017400 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
 - 2. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
 - 3. Divisions 7
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or re-building, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 LIST OF WARRANTIES

- A. Schedule: Provide roofing warranties on products and installations as specified in the Sections included in the Project Manuals.

END OF SECTION 017400

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manuals.
 - 4. Warranties.
 - 5. Instruction of Owner's personnel.
 - 6. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
 - 3. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
 - 4. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 6. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

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

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

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

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Provide instructors experienced in operation and maintenance procedures.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Final Acceptance for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017810 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of products in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Changes made by Change Order.
 - d. Changes made following Architect's written orders.
 - e. Details not on the original Contract Drawings.
 - f. Field records for variable and concealed conditions.
 - g. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of the manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017810

SECTION 022102 - EXISTING UTILITIES

PART 1 - GENERAL

1.1 EXISTING UTILITIES

- A. The Contractor shall be responsible for and shall protect existing utilities. Where existing utilities are interrupted, damaged, or taken off line for connection to other facilities, or are taken out of service for any reason associated with the work, the Contractor shall work expeditiously and continuously (including through meals and around the clock) to return the utility to service as soon as possible. Where the Contractor plans to remove existing utilities from service with the prior expressed approval of the utility and the Owner, the Contractor shall coordinate with persons, businesses, or parties that may be affected by the temporary loss of service.
1. As shown in the drawings, the Contractor shall install all conduits, equipment pads, pedestals, etc., for each private utility company. The installation and materials shall be approved and to the satisfaction of each private utility company representative before the underground conduit system shall be turned over to each private utility company to install below ground utilities. The Contractor shall not relinquish ownership of the conduit system until all below ground utilities are pulled/installed and the systems are energized/activated, allowing the retirement of above ground utilities.
 2. All coordination with private utility companies is the sole responsibility of the Contractor. Proper scheduling of private utility company crews to install new services and retire existing services shall rest on the Contractor's timely, advance coordination of the overall project schedule with each private utility company. There shall be no additional contract time granted for the Contractor's failure to coordinate in a timely fashion with the private utility companies.
- B. Any adjustments (temporary or otherwise), protection, support, removal, relocation, or repairs, etc. to utilities shall be performed by the utility (at the expense of the Contractor). Alternatively, if the utility desires, such activity shall be performed by the Contractor at his expense in a manner meeting the approval of the utility.

END OF SECTION 022102

SECTION 024060 – SITE DEMOLITION

PART 1 - GENERAL

1.1 Related Documents

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

1.2 Summary

- A. This Section includes the following:
 - 1. Demolition and removal of buildings. **(N/A)**
 - 2. Demolition and removal of structures.
 - 3. Demolition and removal of site improvements, including curb and gutter, drives, etc.
 - 4. Disconnecting, capping or sealing, and abandoning site utilities in place.
 - 5. Disconnecting, capping or sealing, and removing site utilities.

1.3 Definitions

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Engineer, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.4 Materials Ownership

- A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Historical items indicated remain the Owner's property. Carefully remove and salvage each item in a manner to prevent damage and deliver promptly to the Owner.
- C. Historical items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the Owner, which may be encountered during demolition, remain the Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner.
- D. Cooperate with Owner's archaeologist or historical adviser.

1.5 Submittals

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.

- C. Proposed noise-control measures.
- D. Schedule of demolition activities indicating the following:
 - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 - 2. Dates for shutoff, capping, and continuation of utility services.
- E. Inventory of items to be removed and salvaged.
- F. Inventory of items to be removed by Owner.
- G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.
- H. Record drawings at Project closeout according to Division 1 Section "Contract Closeout."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- I. Landfill records for record purposes indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 Quality Assurance

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Predemolition Conference: Conduct conference at Project site to comply with preinstallation conference requirements of Division 1 Section "Project Meetings."

1.7 Project Conditions

- A. Buildings to be demolished will be vacated and their use discontinued before start of Work. **(N/A)**
- B. Owner assumes no responsibility for actual condition of buildings to be demolished. **(N/A)**
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Asbestos: Evaluation of the properties and determination if asbestos is present will be coordinated by the Owner. Should asbestos be found, an allowance has been set up in the bid schedule for use for asbestos abatement. It will be the Contractor's responsibility to secure pricing from properly licensed personnel to perform removal and disposal of asbestos material. Prior to work beginning, the pricing shall be submitted to the Owner for their review and approval. It shall be the Contractor's responsibility to coordinate all pricing, removal of material, and payment to their subcontractor for this work. The Contractor shall submit to the Owner's Representative a certified letter stating that all asbestos has been removed and provide tickets to the disposal location. **(N/A)**
 - 1. Asbestos will be removed by Contractor before start of Work.
- D. Storage or sale of removed items or materials on-site will not be permitted.

1.8 Scheduling

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations. No building structure, if present, shall be removed without final direction from Owner.

PART 2 - PRODUCTS**2.1 Soil Materials**

- A. Requirements for satisfactory soil materials are specified in Division 2 Section "Earthwork."
 - 1. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site. It is the Contractor's responsibility to coordinate pick-up of soil samples by Owner's representative of material to be used as borrow material for analysis and PD establishment. The Contractor will not be allowed to begin fill operations until this information is established for compaction testing.

PART 3 - EXECUTION**3.1 Examination**

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey the condition of the building, if any, to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
- E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 Utility Services

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
- B. The Contractor will arrange for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work, when requested by Contractor.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished, if any.
 - 1. Arrange to shut off indicated utilities with utility companies.

3.3 Preparation

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- B. Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during demolition operations. **(N/A)**
- C. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets,

walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- D. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- E. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of existing retaining walls, buildings, etc. to remain.
1. Strengthen or add new supports when required during progress of demolition.

3.4 Explosives

- A. Explosives: Use of explosives will not be permitted.
- B. Explosives: Do not bring explosives to the site or use explosives without written consent of Owner and authorities having jurisdiction. Such written consent will not relieve Contractor of total responsibility for injury to people or for damage to property due to blasting operations. Perform required blasting in compliance with governing regulations. **(N/A)**

3.5 Pollution Controls

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.6 Demolition

- A. Building Demolition: Demolish buildings completely and remove from the site. Use methods required to complete Work within limitations of governing regulations and as follows: **(N/A)**
1. Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 2. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 3. Small buildings may be removed intact when permitted by Engineer and approved by authorities having jurisdiction.
 4. Demolish concrete and masonry in small sections.

5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 6. Break up and remove concrete slabs on grade, unless otherwise shown to remain.
 7. Remove air-conditioning equipment without releasing refrigerants.
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction, as follows:
1. Remove below-grade construction, including foundation walls and footings, to at least 12 inches below grade. **(N/A)**
 2. Remove below-grade construction, including foundation walls and footings, to the depths indicated. **(N/A)**
 3. Completely remove below-grade construction, including foundation walls and footings, storm drain, sanitary sewer, water distribution/fire protection, etc.
 4. Break up and remove below-grade concrete slabs, unless indicated to remain.
 5. Break up below-grade concrete slabs into sections no larger than 24 inches square and leave in place.
 6. Remove old debris such as trolley railings and ties, abandoned tanks, vaults, basements, etc.
- C. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings, pavements, utilities, basements, coal shutes, etc., with soil materials according to requirements specified in Division 2 Section "Earthwork", and/or stone as shown in the Construction Plans.
- D. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.7 Disposal Of Demolished Materials

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 024060

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Steel reinforcement bars.
 2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Each type of steel reinforcement.
 2. Bar supports.
- B. Shop Drawings: Comply with ACI SP-066:
1. Include placing drawings that detail fabrication, bending, and placement.
 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For testing and inspection agency.
- B. Field quality-control reports.
- C. Minutes of preinstallation conference.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
 - 1. Store reinforcement to avoid contact with earth.

1.6 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

1.7 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain.

1.8 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 2 - EXECUTION**2.1 PREPARATION**

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

2.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

2.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

2.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

2.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Admixtures.
4. Vapor retarders.
5. Curing materials.
6. Accessories.
7. Repair materials.
8. Concrete mixture materials.
9. Concrete mixture class types.
10. Concrete mixing.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 033543 "Polished Concrete Finishing" for concrete floors scheduled to receive a polished concrete finish.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for inspections and acceptance testing of concrete at Project site.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
2. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction joints, control joints, isolation joints, and joint-filler strips.
 - c. Semirigid joint fillers.

- d. Vapor-retarder installation.
- e. Anchor rod and anchorage device installation tolerances.
- f. Cold- and hot-weather concreting procedures.
- g. Concrete finishes and finishing.
- h. Curing procedures.
- i. Forms and form-removal limitations.
- j. Methods for achieving specified floor and slab flatness and levelness.
- k. Floor and slab flatness and levelness measurements.
- l. Concrete repair procedures.
- m. Concrete protection.
- n. Initial curing of standard-cured and field curing of field-cured test cylinders (ASTM C31/C31M.)
- o. Distribution of test reports.

1.4 **ACTION SUBMITTALS**

A. Product Data:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Natural or other pozzolans.
8. Aggregates.
9. Ground calcium carbonate and aggregate mineral fillers.
10. Admixtures:
 - a. Include limitations of use. Admixtures that do not comply with reference ASTM International requirements must be submitted with test data for approval.
11. Vapor retarders.
12. Curing materials.
13. Joint fillers.
14. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Maximum w/cm ratio.
5. Slump or slump flow limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Intended placement method.
9. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

D. Concrete Schedule: For each location of each class of concrete indicated in "Concrete Mixture Class Types" Article, including the following:

1. Concrete class designation.
2. Location within Project.

3. Final finish for floors.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 1. Installer: Include copies of applicable ACI certificates.
 2. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.
- B. Material Certificates: For each of the following:
 1. Cementitious materials.
 2. Admixtures.
 3. Curing compounds.
 4. Bonding agents.
 5. Adhesives.
 6. Vapor retarders.
 7. Semirigid joint filler.
 8. Joint-filler strips.
 9. Repair materials.
- C. Material Test Reports: For the following:
 1. Portland cement.
 2. Blended hydraulic cement.
 3. Performance-based hydraulic cement.
 4. Fly ash.
 5. Slag cement.
 6. Silica fume.
 7. Natural or other pozzolans.
 8. Aggregates.
 9. Ground calcium carbonate and aggregate mineral filler.
 10. Admixtures.
- D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances in accordance with ACI 117 and in compliance with ASTM E1155.
- E. Research Reports:
 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
 2. For sheet vapor retarder/termite barrier, showing compliance with ICC's Acceptance Criteria AC380.
- F. Preconstruction Test Reports: For each mix design.
- G. Field quality-control reports.
- H. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 1. Manufacturer's production facilities and delivery vehicles certified in accordance with NRMCA's certification requirements or equivalent approval by a State DOT.
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.
 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level 1. Testing agency laboratory supervisor tests to be an ACI-certified Concrete Laboratory Testing Technician, Level 2.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- E. Mockups: Cast concrete slab-on-ground panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship. Provide up to two batches of concrete to demonstrate the number of required mockups.
 1. Slab-on-Ground: Build panel in the location indicated or, if not indicated, as directed by Architect.
 - a. Divide panel into four equal panels to demonstrate saw joint cutting.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 as follows:
 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 2. When air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 3. Do not use frozen materials or materials containing ice or snow.

4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Source Limitations:
1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
 2. Obtain each type of admixture from single source from single manufacturer.
- B. Cementitious Materials:
1. Portland Cement: ASTM C150/C150M, Type I Type II, gray.
 2. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag cement.
 3. Performance-Based Hydraulic Cement: ASTM C1157/C1157M: Type GU, general use.
 4. Pozzolans: ASTM C618, Class C, F, or N.
 5. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
 6. Ground Glass Pozzolan: ASTM C1866/C1866M, Type GS or GE.
 7. Silica Fume: ASTM C1240.
- C. Normal-Weight Aggregates:
1. Coarse Aggregate: ASTM C33/C33M, Class 1N
 2. Maximum Coarse-Aggregate Size: 1 inch nominal.
 3. Fine Aggregate: ASTM C33/C33M.
- D. Lightweight Aggregate: ASTM C330/C330M, 3/4-inch nominal maximum aggregate size.
1. Limit lightweight aggregate for internal curing to prewetted lightweight fine aggregate in accordance with ASTM C1761/C1761M.
- E. Ground Calcium Carbonate or Aggregate Mineral Filler: ASTM C1797. Unless otherwise permitted, do not use mineral filler derived from carbonate sources in concrete for members assigned to Exposure Class S1, S2, or S3.

2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.
- B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.

2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Admixtures with special properties, with documentation of claimed performance enhancement, ASTM C494/C494M, Type S.
- C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M. Include documentation of compliance with limits for alkalis, sulfates, chlorides, or solids content of mixing water from Table 2 in ASTM C1602/C1602M.

2.4 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than **15 mils** thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
 - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- D. Curing Paper: 8 ft. wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- E. Water: Potable water that does not cause staining of the surface.
- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

2.6 ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

- E. Floor Slab Protective Covering: 8 ft. wide cellulose fabric.

2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURE MATERIALS

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:
 - 1. Fly Ash or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Silica Fume: 10 percent by mass.
 - 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 - 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
 - 1. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
 - 2. Use permeability-reducing admixture in concrete mixtures where indicated.

2.9 CONCRETE MIXTURE CLASS TYPES

- A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 Class F1.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Slump Limit: 4 inches, plus or minus 1 inch for concrete.
4. Air Content:
 - a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

B. Class B: Normal-weight concrete used for foundation walls.

1. Exposure Class: ACI 318 Class F1.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Slump Limit: 4 inches, plus or minus 1 inch for concrete.
4. Air Content:
 - a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 Class F1.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Slump Limit: 4 inches, plus or minus 1 inch for concrete.
4. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.
1. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

- A. Comply with ACI 117.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides and sealing to vapor retarder.

3.6 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 1. If a section cannot be placed continuously, provide construction joints as indicated.

2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces (verify with structural engineer).
 8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces (verify with structural engineer).
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.8 APPLICATION OF FINISHING FLOORS AND SLABS

- A. Scratch Finish:
1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
 2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
 3. Apply scratch finish to surfaces to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes.
- B. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
 3. Apply float finish to surfaces to receive trowel finish.
- C. Trowel Finish:
1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
 5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
 6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
 - a. Slabs on Ground:
 - 1) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.

- D. Trowel and Fine-Broom Finish: First apply a trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling in:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases as indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.10 APPLICATION OF CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.
- B. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
 - a) Water.
 - b) Continuous water-fog spray.
 - b. Floors to Receive Polished Finish: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
 - c. Floors To Receive Curing and Sealing Compound:
 - 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 INSTALLATION OF JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s).
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.12 INSTALLATION OF CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 - 1. Repair and patch defective areas when approved by Architect.
 - 2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and match surrounding surface.
 - 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.
- D. Repairing Unformed Surfaces:
 - 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
 3. After concrete has cured at least 14 days, correct high areas by grinding.
 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
 6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
 8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.

2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
 - 13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
 4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.
- C. Delivery Tickets: comply with ASTM C94/C94M.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 150 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests as needed.
 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;

- a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.
 5. Concrete Density: ASTM C138/C138M:
 - a. One test for each composite sample when strength test specimens are cast.
 6. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and standard cure two sets of two 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.
 7. Unit Weight: ASTM C138/C138M density of fresh structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture. The fresh density should be consistent with that associated with the equilibrium density within a tolerance of plus or minus 4 lb/ft.³.
 8. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two standard cured specimens at seven days and one set of two specimens at 28 days.
 - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests:
 - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.14 **PROTECTION**

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using floor slab protective covering.

END OF SECTION 033000

SECTION 033543 – POLISHED CONCRETE FINISHING

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. Section includes:
1. Polished concrete finish for interior concrete floors denoted on Finish Schedule as PC (Polished Concrete). Polished concrete finishes for precast concrete, vertical cast-in-place concrete, and exterior concrete are specified in the sections for those types of concrete.
 2. Furnish all labor, material, equipment, and services necessary for the dry diamond grinding and polishing of concrete floors.
 3. Applying densifying impregnator/sealer and polishing to specified sheen level and aggregate exposure.
 4. Concrete must be cured a minimum of 28 days prior to polishing.

1.3 REFERENCES

- A. American Concrete Institute (ACI):
1. ACI302.1R-89, Guide for Concrete Floor and Slab Construction.
- B. American Society for Testing and Materials:
1. ASTM C779, Standard Test Method for Abrasion of Horizontal Concrete Surfaces.
 2. ASTM C805, Impact Strength.
 3. ASTM G23-81, Ultraviolet Light & Water Spray.
 4. ASTM 1028, Co-efficient of Friction.
 5. ASTM C 150, Type I, II Portland cement conformity, depending on soil conditions.
 6. ASTM C 33, Aggregate conformity.
- C. Other Tests:
1. Reflectivity.

1.4 SUBMITTALS

- A. Submit the following in accordance with Submittal Procedures in Division 1 Sections.
- B. Product data for each grinding machine, including all types of grinding heads, dust extraction system, joint filler, concrete densifying impregnator, penetrating sealer, concrete dyes, joint filler, and any other chemicals used in the process.
- C. Applicators qualification data.
- D. Polished concrete samples for verification: size 3"x3" for each Polished Concrete finish required.
- E. Maintenance procedures for Polished Concrete using diamond impregnated cleaning pads.

1.5 QUALITY ASSURANCE

- A. Certified Contractors:
1. Pre-qualified contractors meeting ALL requirements set forth within specifications.
- B. Mandatory Pre-Pour Installation Conference: Conduct conference at project site to comply with requirements in Division 1 Sections "Special Conditions" and "Administrative Requirements".
1. The mandatory pre-installation conference shall occur prior to any concrete pours.
 2. The purpose of the mandatory pre-installation conference is to review the criteria with the General Contractor, concrete subcontractor, concrete finish manufacturer, concrete finish installer and concrete polishing contractor.
 3. The meeting shall establish the following:
 - a. Roles and expectations of each subcontractor.
 - b. Days and times of concrete pour schedules.

- c. Sequencing of operations for pouring, curing, finishing and protection of finished concrete surfaces.
- C. Provide project names, addresses, contact names, phone numbers of at least (5) five projects of similar scope and size completed by the installer.
- D. Installer/applicator shall be certified by concrete grinding/polishing equipment, chemical manufacturer and caulking manufacturer. Installer/applicator shall provide adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
- E. Manufacturer's Certification: Provide a letter of certification from both the equipment and chemical manufacturer stating that the installer is a Certified Contractor and is familiar with proper procedures and installation requirements recommended by the manufacturer.
- F. Mock-ups:
 - 1. General Contractor to notify applicator 7 days prior to pour to schedule finish of mock-up.
 - 2. Reserve 100 square feet for each color and finish at location adjacent to floor that will receive polish, but will be covered with another flooring material. Mock-up floor shall be placed on the same day, preferably the same pour as the floors to receive polish.
 - 3. Install mock-ups to verify selections made under sample submittal and to demonstrate methods and workmanship proposed for the project. If mock-up not possible, submitted samples will be accepted as demonstrated methods & workmanship.
 - 4. Aggregate selected must be tested to ensure it will accept polish.
 - 5. If stand-alone mockup required, form should be clean and free from extraneous substance and be at least a 10' x 10' with a level plywood bottom on level ground with unobstructed access around all four sides.
 - 6. Control joints should be included in mock-up. Sawing performed by General Contractor can begin as soon as the surface is firm enough not to displace any of the aggregate. Demonstrate 2 colors separated by control joint.
 - 7. Edges should be included in mock-up.
 - 8. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.
 - 9. Provide protection for Mock-up as specified for finished areas.
- G. Environmental Limitations
 - 1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting chemical performance.
 - 2. Flatness and levelness
 - a. Finish Concrete shall have a minimum Floor Flatness rating of at least 40.
 - b. Finish Concrete shall have a minimum Floor Levelness rating of at least 30.
 - c. Finish Concrete shall be cured a minimum of 28 days or at which point equipment can be put on the slab and does not displace aggregate.
 - 3. Application of finish system shall take place a minimum of 21 days prior to fixture & trim installation and/or substantial completion.
 - 4. Finish Concrete area shall be closed to traffic during finish floor application and after application, for the time as recommended by manufacturer.
- H. Concrete Mix Design:
 - 1. Concrete Mixture shall be 3000 PSI or higher, non-air entrained.
 - a. Any admixtures, plasticizers, slag, fly ash or anything taking the place of Portland-based cement shall be kept to a minimum.
 - b. The cement shall be Portland Cement Type I, conforming to ASTM C 150.
 - c. Maintain concrete temperature below 85 degrees. Keep concrete as cool and moist for as long as possible. In essence, decrease rate of hydration and drying to minimize cracking.
 - d. Wet cures are most suitable, but if this cannot be achieved, use a penetrating, dissipating or wax based cure and seal. Do not use a densifier/hardener material due to the grinding of the floor after 6 days.
 - e. All mix designs must be approved by Architect. Send all approved mix designs to Installer/Applicator.
 - f. The Engineer/Architect shall determine the saw cut pattern, color and layout.
 - g. Color loads for integral color should never be smaller than three (3) cubic yards.
 - h. Use one (1) source for cement, aggregates and pozzolans throughout the job. Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.

- i. Wash out all drums before loading. Keep slumps consistent with a maximum of four (4). Minimize driver added water maintaining a .45 water content ratio.
- j. Place concrete to achieve as true and smooth a top surface as possible. Mounds, or dips are not acceptable. GC shall control overall flatness and levelness, including on sloping areas to within tolerances permitted by specification - ASTM E1155.
- k. Slab shall be protected from indention and footprints during pour and curing.

PART 2 - PRODUCTS

2.1 POLISHING MATERIALS

- A. Three-phase 480 Volt generator.
- B. 3 head or 4 head counter rotating, variable speed, electric floor grinding/polishing machines with at least 600 pounds down pressure. For example: HTC 950RX, HTC 800 HD, SASE PDG 8000, Husqvarna PG 820. No substitutions allowed.
- C. HTC/Pullman Dust extraction system, pre-separator, and squeegee attachments with minimum flow rating of 322 cubic feet per minute such as the HTC 75D, HTC 86D, T8600, T12600, Bull 500, Bull 1250 & T55 or C5500. No substitutions allowed.
- D. Grinding tools:
 - 1. Metal bonded diamonds 40, 80 and 150 metal or QuickCut transitional.
 - 2. Resin bonded diamonds 100, 200, 400 and 800 grits.
- E. Grinding Pads for Edges
 - 1. Metal bonded diamonds 50 and 100 grits.
 - 2. Resin bonded diamonds 100, 200,400, and 800 grits.
- F. Hand Grinder with dust extraction attachment and pads.
- G. Densifier: A concrete hardener chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.
 - 1. Ameripolish 3D HS; Ameripolish, Inc.
 - 2. Consolideck LS; PROSOCO
 - 3. Scofield Formula One MP; Sika/Scofield
 - 4. No substitutions allowed.
- H. Control Joint and Saw Cut Filler, two part polyurea.
 - 1. Hi-Tech HT-PE85; Hi-Tech Systems
 - 2. No substitutions allowed.
- I. Dye: A penetrating dye that chemically combines with cured concrete to produce permanent, variegated or translucent color effects.
 - 1. Ameripolish Dye; Ameripolish, Inc.
 - 2. Gemtone Stain; PROSOCO
 - 3. Scofield Formula One Dye; Sika/Scofield
 - 4. No substitutions allowed.
- J. Penetrating Stain Guard: Protection from debris and contaminants
 - 1. Ameripolish 3D SP; Ameripolish, Inc.
 - 2. Consolideck LS Guard; PROSOCO
 - 3. Scofield Formula One Guard-W; Sika/Scofield
 - 4. No substitutions allowed.
- K. Stain Resistor/Inhibitor: Additional protection for food service areas.
 - 1. Ameripolish SR2 Stain Resistor; Ameripolish, Inc.
 - 2. Consolideck Concrete Protector; PROSOCO
 - 3. No substitutions allowed.
- L. Diamond Impregnated Burnishing Pads
 - 1. Trifecta Pads; SASE Company, Inc.

2. Twister Pads; HTC
3. HiperClean Pads; Husqvarna
3. No substitutions allowed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Installer shall examine and approve concrete substrate for conditions affecting performance of finish. General Contractor shall correct conditions that are found to be out of compliance with the requirements of this section. Repairs are not acceptable unless specifically approved on a case-by-case basis by the Architect.
- B. Verify that base slab meet finish and surface profile requirements listed in Division 3, Section "Cast in Place Concrete".
- C. Provide floor clean of materials and debris.
- D. Protect adjacent surfaces as required to prevent damage by the concrete polishing procedure.
- E. Setup grinding machine, dust extraction system, tooling, and generator.
- F. Ensure floor cured to accept polishing application. Concrete must be cured a minimum of 28 days prior to polishing.

3.2 POLISHED CONCRETE APPLICATION

- A. Applicator shall examine the areas and conditions under which work of this section will be provided and the General Contractor shall correct conditions detrimental to the timely and proper completion of the work and the Applicator shall not proceed until unsatisfactory conditions are resolved.
- B. Fill construction joints and cracks with filler products as specified in accordance with manufacturer's instructions colored to match (or contrast) with concrete color as specified by architect. All control joint and decorative saw cut filling must be performed prior to grinding application.
- C. Grind the concrete floor to within 2 -3 inches of wall with 40 grit metal, 80 grit metal and 150 grit metal or QuickCut transitional diamonds removing construction debris, floor slab imperfections and until there is a uniform scratch pattern and desired concrete aggregate exposure is achieved. Each subsequent grind shall be at 90 degrees from each previous grind and remove all the scratches from the previous grind. Vacuum the floor thoroughly using a squeegee vacuum attachment. Utilize the least aggressive diamond tooling necessary to remove all debris and to achieve uniform scratch pattern. Final surface finish to be salt and pepper.
- D. Grind the edges with 50 and 100 grit metal grinding pads, prior to grinding the floor with each step on the larger diamond grinder, removing all the scratches from the previous grit. Vacuum the floor thoroughly after each grind, using a squeegee vacuum attachment.
- E. Polish the floor with resin bonded diamond grits of 100, 200, 400, first polishing the edges with pads of the same grit and then the field of the floor, removing all scratches from the previous grit. After each polish, clean the floor thoroughly using a vacuum with a squeegee attachment. After the 400-grit polishing step thoroughly clean the floor with a mop or auto-scrubber to prepare for dye.
- F. Apply dye color per Manufacturer's recommendations. Apply 2 coats of dye to achieve desired coloration.
- G. Apply densifying impregnator undiluted as per manufacturer's specifications and guidelines. Cover the entire work area liberally and allow to sit for 10 minutes. Apply again to areas where the densifying impregnator has soaked in and allow to sit for an additional 30 minutes. Squeegee excess material off the floor.
- H. Polish the floor with resin bonded diamond grit of 800, first polishing the edges with pads of the same grit and then the field of the floor, removing all scratches from the previous grit. After polishing, clean the floor thoroughly using clean water and an auto-scrubber or a mop and a wet vacuum.
- I. Apply Penetrating Stain Guard with a microfiber applicator and burnish with a fine, 800 grit, or very fine, 1500 grit, diamond impregnated burnishing pad.
- J. Where required, apply Stain Resistor/Inhibitor with a microfiber applicator and burnish with a fine, 800 grit, or very fine, 1500 grit, diamond impregnated burnishing pad.
- K. Upon completion, the work shall be ready for final inspection and acceptance by the customer.

3.3 PATTERNS AND LOGOS

- A. Provide dyed and polished floor patterns and logos as shown on finish drawings.
- B. Saw cut decorative jointing in concrete surfaces to match patterns indicated on drawings.

3.4 PROTECTION

- A. General Contractor shall protect areas to receive polished concrete finish at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:
1. Slab protection prior to polishing concrete floor: General Contractor to apply temporary surface protection to concrete slab. Do not remove until 2 weeks prior to polishing concrete flooring or per the polishing concrete floor contractor.
 - a. Temporary Floor Protection: Provide Heavy-duty, breathable, anti-bacterial, anti-fungal water repelling base coat and flexible surface textured surface mat, seam sealed to resist substrate contamination and liquids from staining substrate surfaces. Meeting Class 1 fire/ flame retardant ASTM E 648 and NFPA 253 standards.
 - 1) Basis of Design: Skudo HT Commercial; Skudousa.com
 2. Protection after polishing concrete floor: General Contractor to apply temporary surface protection to polished concrete flooring.
 - a. Temporary Floor Protection: Provide Heavy duty, flexible 5/16-inch thick, 10 lb. per rigid sheet, textured walking surface with impact resistance of 0.9-inch when tested to ASTM D5420. Seam sealed with manufacturers adhesive tape for maximum water, stain, and spill resistance. Do not apply tape directly to the polished concrete floor.
 - 1) Basis of Design: SkudoBoard; Skudousa.com
 - 2) Acceptable manufacturers: Ram Board
- B. All trades to be informed that the slab must be protected at all times.
- C. Protect finished work until fully cured in accordance with manufacturer's recommendations.
- D. Protect floor from damage until Substantial Completion.
1. Do not allow vehicle and pedestrian traffic on unprotected floor.
 2. Do not allow construction materials, equipment, and tools on unprotected floor.
 3. Do not allow any trade to park any vehicles on the inside slab.
 4. Diaper all hydraulic powered equipment to avoid staining of the concrete.
 5. No pipe cutting machine shall be used on the finished floor slab.
 6. All painters will use drop cloths on the concrete. If paint gets on the concrete, it must be immediately removed.
 7. Place no steel on interior slab to avoid rust stains and gouges. If construction dictates necessity of this, interior slab will be protected with 1/2-inch plyboard.
 8. Do not allow acids and acidic detergents to come into contact with slab.
 9. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed floor.
- E. Protect floor from traffic for at least 24 hours and from water for at least 72 hours after completion of polishing and dyeing.

PART 4 - SCHEDULES**4.1 SHEEN**

- A. Polished Concrete Level 1 – 400 grit (Matte Finish):
1. At a distance 30 to 50 feet, the floor will reveal moderate light reflection.
 - a. Yield an average gloss reading of 20-40, as measured by a Horiba Gloss Meter.
- B. Polished Concrete Level 2 - 800 grit (Medium Gloss Finish):
1. At a distance of 30 to 50 feet, the floor will reveal moderate light reflection.
 - a. Yield an average gloss reading of 40-60, as measured by a Horiba Gloss Meter.

4.2 EXPOSED AGGREGATE

- A. Minimal exposure, Salt and Pepper

4.4 COLOR

- A. Dye Color: See Finish Schedule.

END OF SECTION 033543

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Lintels.
 - 3. Brick.
 - 4. Mortar and grout materials.
 - 5. Reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Accessories.
 - 9. Mortar and grout mixes.
- B. Products Installed but not Furnished under This Section:
 - 1. Steel lintels in unit masonry.
 - 2. Steel shelf angles for supporting unit masonry.
 - 3. Cavity wall insulation adhered to masonry backup.
- C. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
 - 2. Section 072100 "Thermal Insulation" for cavity wall insulation.
 - 3. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
 - 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
 - 1. Concrete face brick, in the form of small-scale units.
 - 2. Clay face brick, in the form of straps of five or more bricks.
 - 3. Colored mortar.
 - 4. Weep/cavity vents.
- D. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick, in the form of straps of five or more bricks.
 - 2. Weep/cavity vents.
 - 3. Cavity drainage material.
 - 4. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence in accordance with ASTM C67/C67M.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.
 - 6. Reinforcing bars.
 - 7. Joint reinforcement.
 - 8. Anchors, ties, and metal accessories.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 - 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602.
- D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (610 mm) down both sides of walls, and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (610 mm) 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 three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain exposed masonry units cementitious mortar components and mortar aggregate from single source producer or manufacturer.
- B. For exposed masonry units and cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry by testing masonry prisms in accordance with ASTM C1314.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 1. Where fire-resistance-rated construction is indicated, use the equivalent thickness method for masonry units in accordance with ACI 216.1.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested in accordance with ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, will show no visible water or leaks on the back of test specimen.
- C. CMUs: ASTM C90, normal weight unless otherwise indicated.
 1. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.
- D. Concrete Building Brick: ASTM C55, normal weight unless otherwise indicated.
 1. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/2 inches (70 mm) high by 7-5/8 inches (194 mm) long.

2.5 LINTELS

- A. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 032000 "Concrete Reinforcing," and with reinforcing bars indicated.
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
- C. Offset Angle Supports: Steel plate brackets anchored to structure, allowing continuous insulation behind shelf angle supporting veneer. Component and anchor size and spacing engineered by manufacturer.
 1. Carbon Steel, Galvanized after Fabrication: ASTM A1008/A1008M, with ASTM A153/A153M, Class B coating.

2.6 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216 or hollow brick complying with ASTM C652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area), Grade SW, Type FBX.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Alabama Brick.
 - b. Acme Brick Company.
 - c. Belden Brick Company (The).
 - d. Boral Bricks, Inc; Boral Limited.
 - e. Endicott Clay Products Co.
 - f. General Shale Brick, Inc.
 - g. Glen-Gery Corporation.
 - h. Other manufacturers approved by the Architect when submitted in accordance with the requirements of Section 012500 SUBSTITUTION PROCEDURES.
 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested in accordance with ASTM C67/C67M.
 4. Efflorescence: Provide brick that has been tested in accordance with ASTM C67/C67M and is rated "not effloresced."
 5. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
 6. Application: Use where brick is exposed unless otherwise indicated.
 7. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork, for prior approval.
 8. **Color and Texture: Match color and texture of brick on at adjacent buildings on campus. Equal to Alabama Brick – "River Street"**
- C. Building (Common) Brick: ASTM C62, Grade SW.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3350 psi (23.10 MPa).
 2. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.
 3. Application: Use where brick is indicated for concealed locations. Face brick complying with requirements for grade, compressive strength, and size indicated for building brick may be substituted for building brick.

2.7 **MORTAR AND GROUT MATERIALS**

- A. Masonry Cement: ASTM C91/C91M.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Holcim (US) Inc.
 - b. Lafarge North America Inc.
 - c. Lehigh White Cement Company.
- B. Colored Cement Products: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Colored Masonry Cement:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Holcim (US) Inc.
 - 2) Lafarge North America Inc.
 - 3) Lehigh Hanson; HeidelbergCement Group.

2. Formulate blend as required to match color on at adjacent buildings on campus.
 3. Pigments do not exceed 5 percent of masonry cement by weight.
- C. Aggregate for Mortar: ASTM C144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- D. Aggregate for Grout: ASTM C404.
- E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C ASTM C1384, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Euclid Chemical Company (The); an RPM company.
 - b. GCP Applied Technologies Inc.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ACM Chemistries.
 - b. Euclid Chemical Company (The); an RPM company.
 - c. GCP Applied Technologies Inc.
 - d. Master Builders Solutions.
- G. Water: Potable.

2.8 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Heckmann Building Products, Inc.
 - b. Hohmann & Barnard, Inc.
 - c. Wire-Bond.
- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
1. Interior Walls: Hot-dip galvanized carbon steel.
 2. Exterior Walls: Hot-dip galvanized carbon steel.
 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
 4. Wire Size for Cross Rods: 0.187-inch (4.76-mm) diameter.
 5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (406 mm) o.c.
 7. Provide in lengths of not less than 10 ft. (3 m), with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hohmann & Barnard, Inc.
 - b. Wire-Bond.
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Heckmann Building Products, Inc.
 - b. Hohmann & Barnard, Inc.
 - c. Wire-Bond.
2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.6 mm) and maximum vertical adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.

2.9 TIES AND ANCHORS

- A. General: Ties and anchors extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
 3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated bent to configuration indicated.
 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.10 EMBEDDED FLASHING

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.
 2. Fabricate continuous flashings in sections 96 inches (2438 mm) long minimum, but not exceeding 12 ft. (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with sawtooth ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
 4. Solder metal items at corners.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 30 mil (0.76 mm).
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Advanced Building Products Inc.
 - 2) Carlisle Coatings & Waterproofing Inc.
 - 3) GCP Applied Technologies Inc.
 - 4) Heckmann Building Products, Inc.
 - 5) Hohmann & Barnard, Inc.
 - 6) W. R. Meadows, Inc.
 - 7) Wire-Bond.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Termination Bars for Flexible Flashing: Aluminum bars 1/8 inch by 1 inch (3.2 mm by 25 mm).

2.11 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vents: Use the following unless otherwise indicated:
 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3.2 mm) less than depth of outer wythe, in color selected from manufacturer's standard.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Heckmann Building Products, Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) Wire-Bond.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 1. Mortar Deflector: Strips, full depth of cavity and 10 inches (254 mm) high, with dovetail-shaped notches that prevent clogging with mortar droppings.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Advanced Building Products Inc.
 - 2) Hohmann & Barnard, Inc.
 - 3) Keene Building Products.
 - 4) Mortar Net Solutions.
 - 5) Wire-Bond.
- F. Proprietary Acidic Masonry Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. EaCo Chem, Inc.
 - c. PROSOCO, Inc.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. For reinforced masonry, use masonry cement or mortar cement mortar.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type M or Type N.
 - 3. For mortar parge coats, use Type S.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored-aggregate mortar for exposed mortar joints.
- E. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 - 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured in accordance with ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build singlewythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested in accordance with ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (13 mm) or minus 1/4 inch (6.4 mm).
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (13 mm).
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6.4 mm) in a story height or 1/2 inch (13 mm) total.
- B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft. (6.4 mm in 3 m), or 1/2-inch (13-mm) maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft. (3.2 mm in 3 m), 1/4 inch in 20 ft. (6.4 mm in 6 m), or 1/2-inch (13-mm) maximum.
 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft. (6.4 mm in 3 m), 3/8 inch in 20 ft. (10 mm in 6 m), or 1/2-inch (13-mm) maximum.
 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 ft. (3.2 mm in 3 m), 1/4 inch in 20 ft. (6.4 mm in 6 m), or 1/2-inch (13-mm) maximum.
 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft. (6.4 mm in 3 m), 3/8 inch in 20 ft. (10 mm in 6 m), or 1/2-inch (13-mm) maximum.
 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft. (6.4 mm in 3 m), or 1/2-inch (13-mm) maximum.
 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.6 mm) except due to warpage of masonry units within tolerances specified for warpage of units.
- C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.2 mm), with a maximum thickness limited to 1/2 inch (13 mm).
 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3.2 mm).
 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (10 mm) or minus 1/4 inch (6.4 mm).
 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3.2 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3.2 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch (102-mm) horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (102 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (102-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches (610 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- E. Cut joints flush where indicated to receive waterproofing cavity wall insulation air barriers unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods as follows:
 1. Individual Metal Ties: Provide ties as indicated installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. (0.25 sq. m) of wall area spaced not to exceed 24 inches (610 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (914 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (305 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 indicated.
 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (152 mm).
 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 1. Provide an open space not less than 2 inches (51 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (914 mm) o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Install preformed control-joint gaskets designed to fit standard sash block.
 2. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:

1. Build flanges of factory-fabricated, expansion-joint units into masonry.
2. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where indicated and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are indicated without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches (203 mm) at each jamb unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (203 mm), and through inner wythe to within 1/2 inch (13 mm) of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (51 mm) on interior face.
 3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (203 mm), and 1-1/2 inches (38 mm) into the inner wythe.
 4. At lintels and shelf angles, extend flashing 6 inches (152 mm) minimum, to edge of next full unit at each end. At heads and sills, extend flashing 6 inches (152 mm) minimum, to edge of next full unit and turn ends up not less than 2 inches (51 mm) to form end dams.
 5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
 1. Use specified weep/cavity vent products to form weep holes.
 2. Space weep holes 24 inches (610 mm) o.c. unless otherwise indicated.
- D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Accessories" Article.

3.12 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches (1524 mm).

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.
- B. Inspections: Special inspections in accordance with Level 2 in TMS 402.
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content and compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.
- G. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 7 days and at 28 days.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strip-pable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047200 - CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cast-stone trim including the following:
 - a. Wall caps & column caps
- B. Related Sections:
 - 1. Section 04810 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
 - 1. Include building elevations showing layout of units and locations of joints and anchors.
- C. Samples for Verification:
 - 1. For each color and texture of cast stone required, 10 inches (250 mm) square in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and testing agency.
 - 1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364[, including test for resistance to freezing and thawing].
 - 1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 048100 "Unit Masonry Assemblies."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
 - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
 - 2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
- C. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.
- D. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- E. Admixtures: Use only admixtures specified or approved in writing by Architect.
 - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
 - 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
 - 3. Air-Entraining Admixture: ASTM C 260/C 260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.]
 - 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
- F. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of cast-stone material.
 - 1. Epoxy Coating: ASTM A 775/A 775M.
 - 2. Galvanized Coating: ASTM A 767/A 767M.
- G. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.3 CAST-STONE UNITS

- A. Cast-Stone Units: Comply with ASTM C 1364.
 - 1. Units shall be manufactured using the vibrant dry tamp method.
 - 2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
 - 1. Provide drips on projecting elements unless otherwise indicated.
- C. Fabrication Tolerances:
 - 1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
 - 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
 - 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.
 - 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.
- D. Cure Units as Follows:
 - 1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
 - 2. Keep units damp and continue curing to comply with one of the following:

- a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
- E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- F. Colors and Textures: As selected by Architect from manufacturer's full range.

2.4 MORTAR MATERIALS

- A. Masonry Cement: ASTM C 91/C 91M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Holcim (US) Inc.
 - b. Lafarge North America Inc.
 - c. Lehigh Hanson; Heidelberg Cement Group.
 - d. Lehigh White Cement Company.
 - B. Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Colored Masonry Cement:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Holcim (US) Inc.
 - 2) Lafarge North America Inc.
 - 3) Lehigh Hanson; Heidelberg Cement Group.
 - 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 3. Pigments shall not exceed 5 percent of masonry cement by weight.
 - C. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
 - D. Water: Potable.

2.5 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. EaCo Chem, Inc.
 - c. PROSOCO, Inc.

2.6 MORTAR MIXES

- A. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use masonry cement mortar unless otherwise indicated.
- B. Comply with ASTM C 270, Proportion Specification.
 - 1. For setting mortar, use Type N.
 - 2. For pointing mortar, use Type N.

2.7 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C 1364.
 - 1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- B. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- C. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Set units with joints 1/4 to 3/8 inch (6 to 10 mm) wide unless otherwise indicated.
 - 2. Build anchors and ties into mortar joints as units are set.
 - 3. Fill dowel holes and anchor slots with mortar.
 - 4. Build concealed flashing into mortar joints as units are set.
 - 5. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 - 6. Keep joints at shelf angles open to receive sealant.
- D. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- E. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- F. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- G. Rake out joints for pointing with sealant to depths of not less than 3/4 inch (19 mm). Scrub faces of units to remove excess mortar as joints are raked.
- H. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."
 - 1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- I. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Build in compressible foam-plastic joint fillers where indicated.
 - 3. Form joint of width indicated, but not less than 3/8 inch (10 mm).
 - 4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
 - 5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07920 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12 mm) maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 04720

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural-steel materials.
 - 2. Shrinkage-resistant grout.
 - 3. Shear stud connectors.

- B. Related Requirements:
 - 1. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
 - 2. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame and other steel items not defined as structural steel.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data:
 - 1. Structural-steel materials.
 - 2. High-strength, bolt-nut-washer assemblies.
 - 3. Shear stud connectors.
 - 4. Anchor rods.
 - 5. Threaded rods.
 - 6. Shop primer.
 - 7. Galvanized-steel primer.
 - 8. Galvanized repair paint.
 - 9. Shrinkage-resistant grout.

- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- C. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, shop-painting applicators and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural-steel materials, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 2. Shear stud connectors.
- F. Source quality-control reports.
- G. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172). Fabricators who do not participate in the AISC Quality Certification Program may submit documentation showing that they have successfully completed at least five projects of similar construction. The design team will consider this submittal in lieu of AISC certification.
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. Installers who do not participate in the AISC Certification Program may submit documentation showing that they have successfully completed at least five projects of similar construction. The design team will consider this submittal in lieu of AISC certification.
- C. Shop-Painting Applicator Qualifications: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3.
- D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
 - 2. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - 1. Fabricator's experienced steel detailer selects or completes connections in accordance with ANSI/AISC 303.
 - a. Select and complete connections using schematic details indicated and ANSI/AISC 360.
 - b. Use Allowable Stress Design; data are given at service-load level.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M.
- B. Channels, Angles, M-Shapes: ASTM A36/A36M.
- C. Channels, Angles, S-Shapes: ASTM A36/A36M.
- D. Plate and Bar: ASTM A36/A36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
- F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - 1. Finish: Black except where indicated to be galvanized.
- G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A36/A36M carbon steel.
 - 4. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A36/A36M carbon steel.
 - 3. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- C. Threaded Rods: ASTM A36/A36M.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 3. Finish: Plain.

2.5 PRIMER

- A. Steel Primer:
 - 1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer: MPI#26.
 - 1. Etching Cleaner: MPI#25, for galvanized steel.
 - 2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.6 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
 4. Mark and match-mark materials for field assembly.
 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 2.
- F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces unless indicated to be painted.
 6. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
1. SSPC-SP 2.
- C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94/E94M.
 4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
 5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.
 - 1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.

- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with ANSI/AISC 303 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.
- C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
 - 1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 - 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Liquid Penetrant Inspection: ASTM E165/E165M.

- 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.
3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
- a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 051200

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
- B. Related Requirements:
 - 1. Section 061600 Sheathing
 - 2. Section 092216 Nonstructural Metal Framing

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Exterior non-load-bearing wall framing.
- B. Delegated Design Submittal: For cold-formed steel framing.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Stud Manufacturers Association, or the Supreme Steel Framing System Association.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing"

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [AllSteel & Gypsum Products, Inc.](#)
 - 2. [ClarkDietrich](#).
 - 3. [MarinoWARE](#).
 - 4. [SCAFCO Steel Stud Company](#).
 - 5. [Steel Network, Inc. \(The\)](#).
 - 6. [Steeler, Inc.](#)

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1 inch (25 mm).
 - 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S200 and ASTM C955, Section 8.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm).
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4 inches (32 mm).
- C. Vertical Deflection Clips, Exterior: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [AllSteel & Gypsum Products, Inc.](#)
 - b. [ClarkDietrich.](#)
 - c. [Marino\WARE.](#)
 - d. [SCAFCO Steel Stud Company.](#)
 - e. [Steel Construction Systems.](#)
 - f. [Steel Network, Inc. \(The\).](#)
 - g. [Steeler, Inc.](#)
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
 - 2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
 - 2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Gusset plates.
 - 7. Stud kickers and knee braces.
 - 8. Hole-reinforcing plates.
 - 9. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- D. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20.
- B. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches (406 mm) or As indicated on Drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to [bypassing] [infill] studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at centers indicated centers indicated on Shop Drawings.

- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

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: Several items in list below are not described in detail in Part 2. These items are covered by material requirements and articles such as "Miscellaneous Framing and Supports," but they must be indicated in detail on Drawings.
 - 1. Shelf angles.
 - 2. Metal bollards.
 - 3. Metal downspout boots.
 - 4. Steel framing and supports for overhead doors.
 - 5. Steel framing and supports for countertops.
 - 6. Steel framing and supports for mechanical and electrical equipment.
 - 7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 2. Section 051200 "Structural Steel Framing" for steel framing, supports, and other steel items attached to the structural-steel framing.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Fasteners.
 - 2. Shop primers.
 - 3. Shrinkage-resisting grout.
 - 4. Metal bollards.
 - 5. Metal downspout boots.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 1. Steel framing and supports for overhead doors.
 - 2. Alternating tread devices.
 - 3. Metal bollards.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design alternating tread devices.
- B. Structural Performance of Aluminum Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
- C. Structural Performance of Alternating Tread Devices: Alternating tread devices shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Alternating Tread Device Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Comply with applicable railing loadings in Section 055213 "Pipe and Tube Railings."

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless Steel Floor Plate: ASTM A793.
- G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallurgically bonded to steel.
- H. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- I. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- J. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- K. Aluminum Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.
- L. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.
- M. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- N. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- O. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).
- P. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (lead red brass) or UNS No. C84400 (lead semired brass).
- Q. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500.
- R. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 1. Provide stainless steel fasteners for fastening aluminum stainless steel or nickel silver.
 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy [Group 2 (A4)].
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 **FABRICATION, GENERAL**

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface].
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.5 **SHELF ANGLES**

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.

2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.6 METAL LADDERS

- A. General:
 1. Comply with ANSI A14.3.

2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 1. Cap bollards with 1/4-inch- (6.4-mm-) thick, steel plate with domed top.
 2. Retain first paragraph below if required for mounting bollards on structural slab or on existing pavement.
- B. Prime steel bollards with zinc-rich primer.

2.9 METAL DOWNSPOUT BOOTS

- A. Zurn Z191 or equal.
- B. Source Limitations: Obtain downspout boots from single source from single manufacturer.
- C. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
 1. Outlet: Vertical, to discharge into pipe Horizontal, to discharge into pipe.
- D. Prime cast-iron downspout boots with zinc-rich primer.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.11 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
 - 1. Do not fill removable bollards with concrete.
- B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

3.3 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe railings.
 - a. Includes removable section railing

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2, "Structural Welding Code--Aluminum."

1.6 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL AND IRON

- A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Castings: Either gray or malleable iron, unless otherwise indicated.
 - 1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
 - 2. Malleable Iron: ASTM A 47/A 47M.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Shop Primers: Provide primers that comply with Division 9 painting Sections.
- C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the 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. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded, if steel, and nonwelded, if aluminum, connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
 - 1. By radius bends of radius indicated.
- K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. Removable Railings:
 1. Where indicated, provide mounting flanges for removable sections of railings, equal to:
 - a. Edge Fall Protection, LLC, face-mounted edge brackets.
 - 1) www.EDGEfallprotection.com, 844-314-1374
 - b. Position in the field, provide proper attachment to mounting edges.
 - c. Finish to match railings.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
 1. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
- B. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections at steel: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch (3-mm) buildup, sloped away from post.

3.5 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
 - 1. At steel handrails: Use type of bracket with predrilled hole for exposed bolt anchorage.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For hollow masonry anchorage, use toggle bolts.
 - 2. For steel-framed gypsum board partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wood products.
 - 2. Wood-preservative-treated lumber.
 - 3. Miscellaneous lumber.
 - 4. Wood blocking and nailers.
 - 5. Wood furring and grounds.
 - 6. Plywood backing panels.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. OSB: Oriented strand board.
- E. Lumber grading agencies, and abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. SPIB: The Southern Pine Inspection Bureau.
 - 4. WCLIB: West Coast Lumber Inspection Bureau.
 - 5. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
 - 1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
 - 2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.

- B. Maximum Moisture Content of Lumber:
 - 1. Boards: 15 percent.
 - 2. Dimension Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

- C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

2.2 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWPA U1, Use categories as follows:
 - 1. UC3A (Commodity Specification A): Coated sawn products in exterior construction not in contact with ground but exposed to all weather cycles including intermittent wetting. Include the following items:
 - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT TREATMENT

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - 1. Treatment is not to promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency and other information required by authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- E. Application: Treat all rough carpentry unless otherwise indicated.
 - 1. Concealed blocking.
 - 2. Framing for non-load-bearing exterior walls.
 - 3. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 - 4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.

2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
 7. Northern species; NLGA.
 8. Eastern softwoods; NeLMA.
- C. Utility Shelving: Lumber with 15 percent maximum moisture content of any of the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine or southern pine; No. 1 grade; SPIB.
 3. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir; Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods; No. 2 Common grade; NeLMA.
 5. Northern species; No. 2 Common grade; NLGA.
 6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- H. Roofing Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.

2.5 WOOD PLASTIC COMPOSITE LUMBER

- A. Material Description: Composite Boards consisting of recycled Linear Low-Density Polyethylene (LLDPE) and recycled wood extruded into shapes and sizes as follows:
1. 1" x 7 1/4" and 2" x 5 1/2"
 2. Color – To be selected by Architect from manufacturer's standard list of colors.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Basis of Design: Trex Horizon Fencing.
 - a. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Trex
 - 2) FenceTrac
 - 3) Greenwood Fence

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

2.8 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
- B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- H. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- K. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with approved fastener patterns where applicable.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 - 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally at 24 inches (610 mm) o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 – SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated plywood.
 - 2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Preservative-Treated Plywood

1. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - a. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

B. Fire-Retardant Treated Plywood

1. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
2. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
 - a. Use treatment that does not promote corrosion of metal fasteners.
 - b. Exterior type is suitable for both exterior and interior applications. Interior type is only for interior applications.
 - c. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - d. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
3. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
4. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

2.3 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Products: in to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. Georgia-Pacific Building Products; Dens-Glass Gold.
 - c. USG Corporation; Securock.
 - d. DensElement Barrier System
 - 1) Note: coordinate with Section 072726
2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. For, parapet, and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

- D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.
- G. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- B. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.6 MISCELLANEOUS MATERIALS

- 1. Adhesives shall have a VOC content of 50 g/L or less.
- 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall, sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood roof trusses.
 - 2. Wood truss bracing.
 - 3. Metal truss accessories.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for roof sheathing and subflooring.
- C. Allowances: Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For wood-preserved-treated lumber, fire-retardant-treated lumber, metal-plate connectors, metal truss accessories, and fasteners.
 - 1. Include data for wood-preserved treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Shop Drawings: Show fabrication and installation details for trusses.
 - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
 - 2. Indicate sizes, stress grades, and species of lumber.

3. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
 4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
 5. Show splice details and bearing details.
- C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For metal connector-plate manufacturer professional engineer and fabricator.
- B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.
- D. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated lumber.
 2. Fire-retardant-treated wood.
 3. Metal-plate connectors.
 4. Metal truss accessories.

1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

- B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
1. Design Loads: As indicated.
 2. Maximum Deflection Under Design Loads:
 - a. Roof Trusses: Vertical deflection of 1/240 of span.
- C. Comply with applicable requirements and recommendations of the following publications:
1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 3. TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

1.9 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Provide dressed lumber, S4S.
 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for both top and bottom chords.
- C. Minimum Specific Gravity for Top Chords: 0.50.
- D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

1.10 METAL CONNECTOR PLATES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alpine Engineered Products, Inc.; an ITW company.
 2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
 3. CompuTrus, Inc.
 4. Eagle Metal Products.
 5. Jager Building Systems, Inc.; a Tembec/SGF Rexfor company.
 6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
 7. Robbins Engineering, Inc.
 8. Truswal Systems Corporation; an ITW company.
- B. Source Limitations: Obtain metal connector plates from single manufacturer.
- C. General: Fabricate connector plates to comply with TPI 1.

- D. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
 - 1. Use for interior locations unless otherwise indicated.
- E. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304, and not less than 0.035 inch thick.

1.11 **FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
- B. Nails, Brads, and Staples: ASTM F 1667.

1.12 **METAL FRAMING ANCHORS AND ACCESSORIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. KC Metals Products, Inc.
 - 3. Phoenix Metal Products, Inc.
 - 4. Simpson Strong-Tie Co., Inc.
 - 5. USP Structural Connectors.
- C. Allowable Design Loads: Provide products with allowable design loads, 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.
- D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- E. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304.
 - 1. Use for exterior locations and where indicated.

- G. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fastens to one side of truss, top plates, and side of stud below.
- H. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.
- I. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/2 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss, inside face of top plates, and both sides of stud below.
- J. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches wide by 0.050 inch thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- K. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

1.13 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.
- B. Protective Coatings: SSPC-Paint 22, epoxy-polyamide primer.

1.14 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

1.15 SOURCE QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
 - 1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
 - 2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.
- B. Correct deficiencies in Work that special inspections indicate does not comply with the Contract Documents.

PART 2 - EXECUTION**2.1 INSTALLATION**

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses 24 inches o.c.; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
 - 1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Section 061000 "Rough Carpentry."
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- L. Replace wood trusses that are damaged or do not meet requirements.
 - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

2.2 REPAIRS AND PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- C. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- D. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
 - 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 061753

SECTION 064116 –PLASTIC LAMINATE FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-clad architectural cabinets.
 - 2. Cabinet hardware and accessories.
 - 3. Miscellaneous materials: Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
 - 2. Section 123623 "Plastic-Laminate-Clad Countertops."
 - 3. Section 123661.16 "Solid Surfacing Countertops."
 - 4. Section 123661.19 "Quartz Agglomerate Countertops."

1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data:
 - 1. Plastic-laminate-clad architectural cabinets.
 - 2. Cabinet hardware and accessories.
 - 3. Miscellaneous materials, including, panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, fire-retardant-treated materials, and cabinet hardware and accessories.
- B. Product Data Submittals: For each product.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. Shop Drawings:
 - 1. Include dimensioned plans, elevations, sections, and attachment details.
 - 2. Show full-size details.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.
- E. Samples for Initial Selection: For each type of exposed finish.
- F. Samples for Verification: For the following:
 - 1. Plastic Laminates: for each type, color, pattern, and surface finish required.
 - 2. 3mm PVC Edge Band: for each color.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications:
 - 1. Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Unless otherwise indicated, comply with AWI's Architectural Woodwork Standards for grades of interior architectural woodwork, construction finishes and other requirements.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.
- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS**2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS**

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.
- F. Exposed Surfaces:
 - 1. Plastic-Laminate Grade:
 - a. Horizontal Surfaces: Grade HGS.
 - b. Postformed Surfaces: Grade HGP.
 - c. Vertical Surfaces: Grade VGS.
 - 2. Edges: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
 - 3. Pattern Direction: As indicated.
- G. Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, ISO 4586-3.

- a. Edges of Plastic-Laminate Shelves: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
- b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.
- 2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
- 3. Drawer Bottoms: Thermally fused laminate panels.
- H. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.
- J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - 2. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 3. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of ISO 4586.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- C. Metal Decorative Pulls: Back mounted, solid metal
 - 1. Basis of Design: Jeffery Alexander- Regan Collection 847-128SN
 - a. Finish: Satin Nickel.
- D. Hinges: 2-3/4-inch (70-mm), 5-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
 - 1. Stanley #1592.
- E. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141
- F. Adjustable Shelf Standards: BHMA 84071.
 - 1. Shelf Rests for Standards: BHMA B84401B04081.
- G. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081
- H. Shelf Rests: ANSI/BHMA A156.9, B04013; metal
- I. Drawer Slides: ANSI/BHMA A156.9.
 - 1. Standard Duty (Grade 1 and Grade 2): Side mount and extending under bottom edge of drawer.
 - 2. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount.
 - a. Type: Full extension.
 - b. Material: Zinc-plated ball bearing slides.
 - c. Motion Feature: Soft close dampener

3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-200.
 6. For computer keyboard shelves, provide Grade 1HD-100.
 7. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200.
- J. Slides for Sliding Glass Doors: ANSI/BHMA A156.9, B07063; aluminum.
- K. Door Locks: ANSI/BHMA A156.11, E07121.
- L. Drawer Locks: ANSI/BHMA A156.11, E07041.
- M. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.
- N. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.
- O. Grommets for Cable Passage: 1-1/4-inch (32-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Color: As selected by Architect from manufacturer's full range.
- P. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
1. Dark, Oxidized, Satin Bronze, Oil Rubbed: ANSI/BHMA 613 for bronze base; ANSI/BHMA 640 for steel base; match Architect's sample.
 2. Bright Brass, Clear Coated: ANSI/BHMA 605 for brass base; ANSI/BHMA 632 for steel base.
 3. Bright Brass, Vacuum Coated: ANSI/BHMA 723 for brass base; ANSI/BHMA 729 for zinc-coated-steel base.
 4. Satin Brass, Blackened, Bright Relieved, Clear Coated: ANSI/BHMA 610 for brass base; ANSI/BHMA 636 for steel base.
 5. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.
 6. Bright Chromium Plated: ANSI/BHMA 625 for brass or bronze base; ANSI/BHMA 651 for steel base.
 7. Satin Stainless Steel: ANSI/BHMA 630.
- Q. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Type I, waterproof type (at wet locations) and Type II water-resistant type as selected by fabricator to comply with requirements.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual."
 - 1. For glass in frames, secure glass with removable stops.
 - 2. For exposed glass edges, polish and grind smooth.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - 1. Use filler matching finish of items being installed.
- D. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
- E. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

SECTION 072100 - THERMAL 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:
 - 1. Extruded polystyrene foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Extruded polystyrene foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.

1.4 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
 - 1. Sign, date, and post the certification in a conspicuous location on Project site.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type X: ASTM C578, Type X, 15-psi (104-kPa) minimum compressive strength; unfaced.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DuPont de Nemours, Inc.
 - b. Owens Corning.
 - c. The Dow Chemical Company.
 - 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
 - 4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed; SAINT-GOBAIN.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

2.3 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 1. At Contractor's option, provide one of the following as application requires:
 - a. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 - b. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
 - c. Polyurethane Pour-In-Place Insulation: Closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84, specifically formulated for pour-in-place applications.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

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 fluid-applied, vapor-retarding and membrane air barriers.
- B. Related Requirements:
 - 1. Section 076200 "Sheet Metal Flashing and Trim" for flexible flashing.

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
 - 2. Laboratory Test Reports for Credit IEQ 4: For air barriers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
 - 1. Build integrated mockups of exterior wall assembly as shown on Drawings, 150 sq. ft. (14 sq. m), incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.

- b. Include junction with roofing membrane, building corner condition, and foundation wall intersection].
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
- B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
 1. Qualitative Air-Leakage Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 2. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D 4541.
 3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.
- C. Low-Emitting Materials: Air barriers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 283.

2.3 VAPOR-RETARDING MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: synthetic polymer membrane.
 1. Basis-of-Design Product: PROSOCO, Inc. "R-Guard".
3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255
 2. Or a comparable product by one of the following:
 - a. Synthetic Polymer Membrane:
 - 1) Grace, W. R., & Co. - Conn.; Perm-A-Barrier Liquid.
 - 2) Henry Company; Air-Bloc 32.
 - 3) W.R. Meadows Air-Shield LMP
 - 4) GE Elemax 2600 AWB

- 5) Carlisle Coatings / Barritech VP
- 6) DensElement Barrier System
 - a) Note: Coordinate with Section 061600
3. Physical and Performance Properties:
 - a. Air Permeance: Maximum [0.0044 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa)] pressure difference; ASTM E 2178.
 - b. Vapor Permeance: ASTM E 96/E 96M.
 - a) 10.0 perm

2.4 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.
- D. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- E. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- F. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, [0.0187 inch (0.5 mm)] [0.0250 inch (0.64 mm)] <Insert dimension> thick, and Series 300 stainless-steel fasteners.
- G. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft (24- to 32-kg/cu. m) density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- H. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- I. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07920 "Joint Sealants."
- J. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
 - 1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches (75 mm) along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.
- B. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

- A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply adhesive-coated transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.
 - 1. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
- H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- I. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, counterflashing strip.
- J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counter-flashings or ending in reglets with termination mastic.
- K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 4. Vapor-Retarding Membrane Air Barrier:
 - a. 10- mils dry film thickness
- C. Apply strip and transition strip over cured air-barrier material overlapping 3 inches (75 mm) onto each surface according to air-barrier manufacturer's written instructions.
- D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

- E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and re-apply air-barrier components.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. [Inspections may include the following:]
 - 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 - 2. Continuous structural support of air-barrier system has been provided.
 - 3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 4. Site conditions for application temperature and dryness of substrates have been maintained.
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
 - 6. Surfaces have been primed, if applicable.
 - 7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 - 8. Termination mastic has been applied on cut edges.
 - 9. Strips and transition strips have been firmly adhered to substrate.
 - 10. Compatible materials have been used.
 - 11. Transitions at changes in direction and structural support at gaps have been provided.
 - 12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 - 13. All penetrations have been sealed.
- C. Tests: As determined by Owner's testing agency from among the following tests:
 - 1. Qualitative Air-Leakage Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, smoke pencil with pressurization or depressurization.
 - 2. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
 - 3. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.
- D. Air barriers will be considered defective if they do not pass tests and inspections.
 - 1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 - 2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
 - 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 076200 - SHEET METAL FLASHING AND TRIM

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 sheet metal flashing and trim:
 - 1. Formed low-slope roof flashing and trim.
 - 2. Formed wall flashing and trim.
 - 3. Formed equipment support flashing.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry Assemblies" for installing through-wall flashing, reglets, and other sheet metal flashing and trim.
 - 2. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 3. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 4. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft. (1.00 to 1.44 kPa): 60-lbf/sq. ft. (2.87-kPa) perimeter uplift force, 90-lbf/sq. ft. (4.31-kPa) corner uplift force, and 30-lbf/sq. ft. (1.44-kPa) outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. 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.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identify material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
 - 4. Details of expansion-joint covers, including showing direction of expansion and contraction.
- C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Flashing: 12 inches (300 mm) long. Include fasteners, [cleats,] [clips,] closures, and other attachments.
 - 2. Trim: 12 inches (300 mm) long. Include fasteners and other exposed accessories.

3. Accessories: Full-size Sample.

1.5 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 2. Review methods and procedures related to sheet metal flashing and trim.
 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. Pre-finished, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
 2. Exposed Finishes: Apply the following coil coating:
 - a. Siliconized-Polyester Coating: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 - 1) Color: As selected by Architect from manufacturer's full range.
- B. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 1. Finish: 2D (dull, cold rolled).
 2. Surface: Smooth, flat.
- D. Pre-finished Aluminum: 0.032 thickness.
 1. Finish: Pre-finished

2.2 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
- B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- C. Burning Rod for Lead: Same composition as lead sheet.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with elastomeric sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.5 ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, seal, and solder or weld watertight.
1. Joint Style: Butt, with 12-inch- (300-mm-) wide concealed backup plate.
 2. Fabricate copings from the following material:
 - a. Pre-finished, Metallic-Coated Steel: 0.0396 inch (1.0 mm) thick.
- B. Roof and Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following material:
1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.
- C. Base Flashing: Fabricate from the following material:
1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.
- D. Counterflashing: Fabricate from the following material:
1. Prepainted, Metallic-Coated Steel: 0.0217 inch (0.55 mm) thick.
- E. Flashing Receivers: Fabricate from the following material:
1. Stainless Steel Steel: 0.0217 inch (0.55 mm) thick.
- F. Roof-Penetration Flashing: Fabricate from the following material:

1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following material:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch (0.7 mm) thick.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
 2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with [elastomeric] [butyl] sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 3/4 inch (19 mm) for wood screws.
 1. Prefinished, Aluminum: Use stainless-steel fasteners.
- H. Seal joints with elastomeric sealant as required for watertight construction.
 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements[, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
 - 1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16-inch (400-mm) centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch (400-mm) centers.
 - 2. Anchor interior leg of coping with screw fasteners and washers at 16-inch (400-mm) centers.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant.
 - 1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 - 2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of manufactured through-wall flashing is specified in Division 4 Section "Unit Masonry Assemblies."

3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-(13-mm-)wide joints formed between two 6-inch-(150-mm-)long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.
- D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

- F. Field-Adhesion-Test Reports: For each sealant application tested.
- G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 - 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each kind of sealant and joint substrate.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
- C. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Single-Component Neutral-Curing Silicone Sealant:
 1. Available Products:
 - a. Dow-Corning 790
 - b. GE Silicones; SilPruf SCS2000.
 - c. Pecora Corporation; 864.
 - d. Pecora Corporation; 890.
 - e. Polymeric Systems Inc.; PSI-641.
 - f. Sonneborn, Division of ChemRex Inc.; Omniseal.
 - g. Tremco; Spectrem 3.

2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 50.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile, and wood.
 6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
- E. Single-Component Neutral-Curing Silicone Sealant:
1. Available Products:
 - a. Dow-Corning 795
 - b. GE Silicones; SilPruf SCS2000.
 - c. Pecora Corporation; 864.
 - d. Pecora Corporation; 890.
 - e. Polymeric Systems Inc.; PSI-641.
 - f. Sonneborn, Division of ChemRex Inc.; Omniseal.
 - g. Tremco; Spectrem 3.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 50.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O: Metal-to-metal, coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile, and wood.
 6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
- F. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:
1. Available Products:
 - a. Dow-Corning 786
 - b. Pecora Corporation; 898.
 - c. Tremco; Tremsil 600 White.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Use Related to Exposure: NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Coated glass color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and ceramic tile.
- G. Single-Component Nonsag Urethane Sealant:
1. Available Products:
 - a. Sika Corporation, Inc.; Sikaflex - 1a.
 - b. Sonneborn, Division of ChemRex Inc.; Ultra.
 - c. Sonneborn, Division of ChemRex Inc.; NP 1.
 - d. Tremco; Vulkem 116.
 2. Type and Grade: S (single component) and NS (nonsag).
 3. Class: 25.
 4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile, and wood.
- H. Single-Component Pourable Urethane Sealant:
1. Available Products:
 - a. Bostik Findley; Chem-Calk 950.
 - b. Pecora Corporation; Urexpam NR-201.
 - c. Polymeric Systems Inc.; Flexiprene 952.

- d. Schnee-Morehead, Inc.; Permthane SM7101.
 - e. Tremco; Tremflex S/L.
 - f. Tremco; Vulkem 45.
2. Type and Grade: S (single component) and P (pourable).
 3. Class: 25.
 4. Use Related to Exposure: T (traffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile, and wood.

2.3 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
- B. Available Products:
 1. Bostik Findley; Chem-Calk 600.
 2. Pecora Corporation; AC-20+.
 3. Schnee-Morehead, Inc.; SM 8200.
 4. Sonneborn, Division of ChemRex Inc.; Sonolac.
 5. Tremco; Tremflex 834.

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
 1. 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.
 2. Available Products:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 1. Available Products:
 - a. Pecora Corporation; BA-98.
 - b. Tremco; Tremco Acoustical Sealant.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- E. Double / Single Sealant Joints:
 1. Provide single sealant joints at the following exterior locations:
 - a. All horizontal joints beneath copings and wall caps.
 - b. All horizontal joints at brick shelf angles.

- c. All vertical joints, i.e. expansion and control joints. Exception: vertical joints of copings and wall caps are to be double sealant joints.
2. Provide double sealant joints at the following exterior locations:
 - a. All horizontal surfaces. Note: turn down the sealant a minimum of two (2) inches over the front edge of the horizontal surface.
 - b. All joints at coping and wall caps.
 - c. All vertical joints at large entablatures and cornice trim of precast, stone, etc.
 - d. Backer Rod Type for Dbl Joints:
 - 1) Open-cell foam type backer rod for interior joint.
 - 2) Closed-cell foam type for outer joint.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.

- d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by pre-construction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that 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 SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application JS-1: Exterior vertical and horizontal nontraffic joints between plant-precast architectural concrete units.
 - 1. Joint Sealant: Single-Component Neutral-Curing Silicone Sealant .
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- B. Joint-Sealant Application JS-2: Exterior vertical control and expansion joints in unit masonry.
 - 1. Joint Sealant: Single-Component Neutral-Curing Silicone Sealant .
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- C. Joint-Sealant Application JS-3: Exterior joints in exterior insulation and finish systems.
 - 1. Joint Sealant: Single-component neutral-curing silicone sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- D. Joint-Sealant Application JS-4: Exterior vertical joints between different materials listed above.
 - 1. Joint Sealant: Single-Component Neutral-Curing Silicone Sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- E. Joint-Sealant Application JS-5: Exterior perimeter joints between different materials listed above and frames of doors windows and louvers.
 - 1. Joint Sealant: Single-Component Neutral-Curing Silicone Sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- F. Joint-Sealant Application JS-6: Exterior control and expansion joints in ceilings and other overhead surfaces.
 - 1. Joint Sealant: Single-Component Neutral-Curing Silicone Sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- G. Joint-Sealant Application JS-7: Exterior control and expansion joints in horizontal traffic surfaces of brick pavers ceramic tile stone paving units.
 - 1. Joint Sealant: Single-component pourable urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- H. Joint-Sealant Application JS-8: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
 - 1. Joint Sealant: Single-component nonsag urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- I. Joint-Sealant Application JS-9: Interior perimeter joints of exterior openings.
 - 1. Joint Sealant: Single-component nonsag urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- J. Joint-Sealant Application JS-10: Interior ceramic and dimension stone tile, expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
 - 1. Joint Sealant: Single-component pourable urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- K. Joint-Sealant Application JS-11: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 1. Joint Sealant: Single-component mildew-resistant neutral-curing silicone sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- L. Joint-Sealant Application JS-12: Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - 1. Joint Sealant: Latex sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- M. Joint-Sealant Application JS-13: Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - 1. Joint Sealant: Latex sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range. **END OF SECTION 079200**

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES 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 hollow-metal work.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
 - 2. Section 084113 "Aluminum-Framed Entrances and Storefronts" for exterior frames

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-(102-mm-)high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ceco Door Products; an Assa Abloy Group company.
 - 2. Curries Company; an Assa Abloy Group company.
 - 3. Megamet Industries, Inc.
 - 4. Steelcraft; an Ingersoll-Rand company.
 - 5. Republic / Allegion
 - 6. Special-Lite
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 3, Model 2.
 - 1. Physical Performance: Level C according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm)
 - c. Face: Cold-rolled steel sheet, minimum thickness of 0.032 inch (0.8 mm).
 - d. Edge Construction: Model 2, Seamless
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, or vertical steel-stiffener core at manufacturer's discretion.
 - 3. Frames:
 - a. Materials: Cold-rolled steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Face welded

2.4 HURRICANE RESISTANT DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Basis of design: Special-Lite SL-17 Pebble Grain Hybrid FRP Door or approved equal.
 - 1. Physical Performance: Must meet or exceed ASTM E1886 and ASTM E1996 Level D as known as "Large Missile Impact"
 - 2. Door:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm.)
 - c. Stiles & Rails:

- 1) Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.
 - 2) Minimum 2-5/16" deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
 - 3) Screw or snap in place applied caps are not acceptable.
 - 4) Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.
 - 5) Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.
 - 6) Meeting stiles to include integral pocket to accept pile brush weather seal.
- d. Corners:
- 1) Mitered.
 - 2) Secured with 3/8" diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.
 - 3) 1-1/4" x 1-1/4" x 3/16" 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.
 - 4) Weld, glue, or other methods of corner joinery are not acceptable.
- e. Face:
- 1) Exterior:
 - a) 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
 - b) Optional painted finish consult manufacturer.
 - c) Class C standard.
 - 2) Interior:
 - a) 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
 - b) Optional painted finish consult manufacturer.
 - c) Class C standard optional Class A available consult manufacturer.
 - 3) Attachment of face sheet.
 - a) Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
 - b) Use of glue to bond face sheet to core or extrusions is not acceptable.
- f. Core:
- 1) Poured-in-place polyurethane foam.
 - 2) Laid in foam cores are not acceptable.
 - 3) Foam Plastic Insulated Doors: IBC 2603.4.
 - a) Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
 - b) Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
 - c) IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032" aluminum or 0.016" steel.
 - d) Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.
- g. Cutouts:
- 1) Manufacture doors with cutouts for required vision lites, louvers, and panels.
- h. Reinforcements.
- 1) Aluminum extrusions made from 6061 or 6063 aluminum alloys.
 - 2) Sheet and plate to conform to ASTM-B209.
 - 3) Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
 - 4) Bars and tubes to meet ASTM-B221.
3. Frames: Section 084113 "Aluminum-Framed Entrances and Storefronts" for exterior frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 08800 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches at latch stile.
 4. Top Edge Closures: Close top edges of doors with inverted closures of same material as face sheets.
 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 1. Sidelight and Transom Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Unless required differently per labeling, provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:
 - 1) Three anchors per jamb from up to 90 inches (1524 to 2286 mm) high.
 - 2) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 - 3) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - c. Post installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
 6. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with [mitered] hairline joints.
 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 **STEEL FINISHES**

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 - 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 - b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
 - c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).
 - d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer, faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Section 088000 "Glazing" for glass view panels in flush wood doors.
 - 2. Section 099123 "Interior Painting", for field finishing doors.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
 - 7. Fire-protection ratings for fire-rated doors.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
 - 2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Provide Samples for each color, texture, and pattern of plastic laminate required.
 - c. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
 - 3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.6 QUALITY ASSURANCE

- A. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Graham Wood Doors; ASSA ABLOY Group company.
 - 3. VT Industries / Eggers
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. Particleboard-Core Doors:
 - 1. Particleboard: ANSI A208.1, Grade LD-1,,.
 - 2. Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.

- b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
- a. Screw-Holding Capability: **[550 lbf (2440 N)]**[**475 lbf (2110 N)]**[**400 lbf (1780 N)]** per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Select white birch.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Pleasing match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
8. Core: Particleboard.
9. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered non-combustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-(1.2-mm)-thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

D. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.

1. Wood Species: Same species as door faces.

E. Metal Louvers:

1. Blade Type: Vision-proof, inverted V.
2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch (1.0 mm) thick, factory primed for paint finish.
3. Metal and Finish: Extruded aluminum with Class II, clear anodic finish, AA-M12C22A31.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Transparent Finish:
1. Grade: Custom.
 2. Finish: , WDMA TR-6 catalyzed polyurethane,.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
1. Install fire-rated doors according to NFPA 80.
 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

- a. Comply with NFPA 80 for fire-rated doors.
- 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083313 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Counter door assemblies.
 - a. At Concessions 1102
 - b. 12'-0" opening width
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for door-opening framing and corner guards.
 - 2. Section 099123 "Interior Painting" for finish painting of factory-primed doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
 - 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. Include description of automatic closing device and testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Show locations of controls, locking devices and other accessories.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Maintenance Proximity: Not more than two 2 hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
 - 1. Obtain operators and controls from coiling counter door manufacturer.

2.2 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
 - 1. **Basis of Design: Overhead Door Corporation, Model 652 Counter Door**
- B. Door Curtain Material: Aluminum.
- C. Door Curtain Slats: Flat profile slats of 1-1/4-inch (32-mm) center-to-center height.
 - 1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- D. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated aluminum extrusion and finished to match door, with astragal.
- E. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- F. Hood: Match curtain material and finish.
 - 1. Shape: Round.
 - 2. Mounting: Face of wall.
- G. Sill Configuration: No sill.
- H. Locking Devices: Equip door with slide bolt for padlock.
 - 1. Locking Device Assembly: Cremona-type, both jamb sides locking bars, operable from interior.
- I. Manual Door Operator: Chain-hoist operator.
- J. Door Finish:
 - 1. Aluminum Finish: Clear anodized.
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 DOOR CURTAIN MATERIALS AND FABRICATION

- A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Aluminum Door Curtain Slats: ASTM B209 (ASTM B209M) sheet or ASTM B221 (ASTM B221M) extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm); and as required.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.
 - 1. Manufacturer's standard.

2.4 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.5 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

2.6 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- C. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches (2130 mm) high.

2.7 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.8 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES

- A. Mill Finish: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: [Owner will engage] [Engage] a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior storefront framing.
 - 2. Exterior manual-swing entrance doors and door-frame units.
- B. Related Requirements:
 - 1. Section 081113 "Hollow Metal Doors and Frames" for exterior doors.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
 - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

- F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.
- C. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
 3. Must meet or exceed ASTM E 1996 Level D also known as "Large Missile Impact"
 4. Must meet or exceed ASTM E 1886
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to $1/175$ of clear span for spans up to 13 feet 6 inches (4.1 m) and to $1/240$ of clear span plus $1/4$ inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch (19.1 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to $1/360$ of clear span or $1/8$ inch (3.2 mm), whichever is smaller.
 - a. Operable Units: Provide a minimum $1/16$ -inch (1.6-mm) clearance between framing members and operable units.
 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than $1/240$ of clear span plus $1/4$ inch (6.35 mm) for spans greater than 11 feet 8- $1/4$ inches (3.6 m) or $1/175$ times span, for spans less than 11 feet 8- $1/4$ inches (3.6 m).
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
 2. Maximum Water Leakage: According to AAMA 501.1 No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.
- J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
1. Outdoor-Indoor Transmission Class: Minimum 26.
- K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
 - c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

2.2 **MANUFACTURERS**

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide Coral Industries, Inc; FL300T Front-line Storefront System by Coral Architectural Products or comparable product by one of the following:
1. EFCO Corporation.
 2. Kawneer North America; an Alcoa company.
 3. YKK AP America Inc.
- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.3 **FRAMING**

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Center.
- B. Finish: Clear Anodized Finish
1. Fabrication Method: Field-fabricated stick system.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 2. Steel Reinforcement: Manufacturer's standard zinc-rich, 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.

- a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
- b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
- c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Doors not specified in this Section are specified in Section 081113 "Hollow Metal Doors and Frames section 2.5 Hurricane Resistant Doors and Frames.

2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.
 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- D. Continuous-Gear Hinges: BHMA A156.26.
- E. Cylinders: As specified in Section 087100 "Door Hardware."
- F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- G. Operating Trim: BHMA A156.6.
- H. Removable Mullions: BHMA A156.3, extruded aluminum.
 1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.
- I. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- J. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- K. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- L. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- M. Weather Stripping: Manufacturer's standard replaceable components.
 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- N. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

- O. Silencers: BHMA A156.16, Grade 1.
- P. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).
- Q. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

2.6 GLAZING

- A. Glazing: Comply with Section 088819 "Hurricane-Resistant Glazing."
 - 1. Safety glazing at all entrances, doors, and sidelights.
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.
- E. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
 - 1. Color: Match structural sealant.

2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

- A. Clear Anodized Finish

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section Section 088819 "Hurricane-Resistant Glazing."
- G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
 1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).

2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).
4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 084113

**SECTION 08 71 00
DOOR HARDWARE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electronic door hardware
 - 3. Cylinders specified for doors in other sections.
 - 4. Electronic access control components and cabling.
- C. Related Sections:
 - 1. Division 06 Section "Rough Carpentry".
 - 2. Division 06 Section "Finish Carpentry".
 - 3. Division 08 Section "Operations and Maintenance".
 - 4. Division 08 Section "Door Schedule".
 - 5. Division 08 Section "Door Hardware Schedule".
 - 6. Division 08 Section "Hollow Metal Doors and Frames".
 - 7. Division 08 Section "Flush Wood Doors".
 - 8. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.

- c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Door and frame sizes and materials.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
- E. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
- 1. Plans for existing key system expansion.
 - 2. Requirements for key control storage.
 - 3. Installation of permanent keys, and software.
 - 4. Address and requirements for delivery of keys.
- F. Pre-installation Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
- 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Five years for exit hardware.
 - 3. Twenty five years for manual surface door closer bodies.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
- C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.

- c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products (MK).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Acceptable Manufacturers:
 - a. Ives (IV).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinders: Original manufacturer cylinders complying with the following:
 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Match existing building key system.
- C. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Key locks to Owner's existing system.
- D. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
- E. Construction Keying: Provide temporary construction cylinders for exterior openings.
- F. Key Registration List (Bitting List):
 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
 - 1. Acceptable Manufacturers:
 - a. Sargent Manufacturing (SA) – 8200 Series.
 - b. Corbin Russwin (CR) – ML2000 Series.

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.7 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 - 7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 - 8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 - 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
 - 1. Acceptable Manufacturers:
 - a. Sargent Manufacturing (SA) - PE80 Series.
 - b. Corbin Russwin (CR) – PED5000 Series.

- C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
 - 1. Provide keyed removable feature where specified in the Hardware Sets.
 - 2. Provide stabilizers and mounting brackets as required.
 - 3. Provide electrical quick connection wiring options as specified in the hardware sets.

2.8 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 - 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
 - 1. Acceptable Manufacturers:
 - a. Sargent Manufacturing (SA) - 1431 Series.
 - b. LCN – 1460 Series
 - c. Norton Rixson – 8000 Series.

2.9 ARCHITECTURAL TRIM

- A. Door Protective Trim
 - 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 - 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
 - 3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
 - 4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
 - 5. Acceptable Manufacturers:
 - a. Ives (IV).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC)

2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Acceptable Manufacturers:
 - a. Ives (IV).

- b. Rockwood Manufacturing (RO).
- c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Acceptable Manufacturers:
 - a. Rixson Door Controls (RF).
 - b. Rockwood Manufacturing (RO).
 - c. Sargent Manufacturing (SA).

2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Manufacturing (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

DOOR HARDWARE

08 71 00

Hardware Schedule

Set: 1.0

Doors: 1101A

Each to receive:

2 Continuous Hinges	CFM95HD1 SLF SER8	CLR	PE
1 Removable Mullion	L980A x 651	US28	SA
1 Exit Device with ELR	72 16 55 56 43 PE8504 ETL 24V RHR	US32D	SA
1 Exit Device	72 16 43 55 PE8510 ETL	US32D	SA
1 Mullion Cylinder	70 980C1	US32D	SA
4 Cylinder Core	As required		
2 Door Closer	1431 P10 x 1431-D	EN	SA
2 Overhead Stop	1ADJ-X26	US32D	RF
2 Astragal	S772D [mount on mullion]		PE
1 Threshold	1715A MSES25SS		PE
2 Wiring Harness	QC-C012P		MK
1 Keypad/Reader	By security contractor		
2 Door Position Switch	DPS	Black	SU
1 Power Supply	AQ Series (By Others)		SU

Gasketing and door sweeps by door manufacturer.

Set: 2.0

Doors: 1101B, 1101C

2 Continuous Hinges	CFM95HD1 SLF	CLR	PE
1 Removable Mullion	L980A x 651	US28	SA
1 Exit Device	72 16 43 PE8804 ETL RHR	US32D	SA
1 Exit Device	72 16 43 PE8810 ETL	US32D	SA
1 Mullion Cylinder	70 980C1	US32D	SA
4 Cylinder Core	As required		
2 Door Closer	1431 P10	EN	SA
2 Overhead Stop	1ADJ-X26	US32D	RF
2 Astragal	S772D [mount on mullion]		PE
1 Threshold	1715A MSES25SS		PE
2 Sweep	3452CNB TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 3.0

Doors: 1106E

Each to receive:

2 Continuous Hinges	CFM83HD1 SLF SER8	CLR	PE
1 Removable Mullion	L980A x 651	US28	SA
1 Exit Device with ELR	72 16 55 56 43 PE8504 ETL 24V RHR	US32D	SA
1 Exit Device	72 16 43 55 PE8510 ETL	US32D	SA
1 Mullion Cylinder	70 980C1	US32D	SA
4 Cylinder Core	As required		
2 Door Closer	1431 P10 x 1431-D	EN	SA
2 Overhead Stop	1ADJ-X26	US32D	RF
2 Astragal	S772D [mount on mullion]		PE
1 Threshold	1715A MSES25SS		PE
2 Wiring Harness	QC-C012P		MK
1 Keypad/Reader	By security contractor		
2 Door Position Switch	DPS	Black	SU
1 Power Supply	AQ Series (By Others)		SU

Gasketing and door sweeps by door manufacturer.

DOOR HARDWARE

08 71 00

Set: 4.0

Doors: 1106F, 1106G, 1106H

2 Continuous Hinges	CFM83HD1 SLF	CLR	PE
1 Removable Mullion	L980A x 651	US28	SA
1 Exit Device	72 16 43 PE8804 ETL RHR	US32D	SA
1 Exit Device	72 16 43 PE8810 ETL	US32D	SA
1 Mullion Cylinder	70 980C1	US32D	SA
4 Cylinder Core	As required		
2 Door Closer	1431 P10	EN	SA
2 Overhead Stop	1ADJ-X26	US32D	RF
2 Astragal	S772D [mount on mullion]		PE
1 Threshold	1715A MSES25SS		PE
2 Sweep	3452CNB TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 5.0

Doors: 1126A

3 Hinges	TA2314 4.5 x 4.5 NRP	US32D	MK
1 Exit Device	72 16 43 PE8804 ETL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 PSH	EN	SA
1 Threshold	171A MSES25SS		PE
1 Sweep	315CN TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 6.0

Doors: 1109A

3 Hinges	TA2314 4.5 x 4.5 NRP	US32D	MK
1 Storeroom Lock	72 8204 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 PSH	EN	SA
1 Threshold	171A MSES25SS		PE
1 Sweep	315CN TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 7.0

Doors: 1106B, 1106C

Each to receive:

6 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Removable Mullion	L980 x 651	USP	SA
2 Exit Device	70 16 43 PE8813 ETL	US32D	SA
1 Mullion Cylinder	70 980C1	US32D	SA
5 Cylinder Core	As required		
2 Door Closer	1431 P10	EN	SA
2 Overhead Stop	1ADJ-X26	US32D	RF
2 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
2 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
2 Silencers	608		RO

Set: 8.0

Doors: 1106B, 1106C

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Exit Device	70 16 43 PE8813 ETL	US32D	SA
4 Cylinder Core	As required		
1 Door Closer	1431 P10	EN	SA
1 Overhead Stop	1ADJ-X26	US32D	RF
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
3 Silencers	608		RO

DOOR HARDWARE

08 71 00

Set: 9.0

Doors: 1104A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Exit Device	72 16 43 PE8804 ETL	US32D	SA
2 Cylinder Core	As required		
1 Door Closer	1431 PSH	EN	SA
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
3 Silencers	608		RO

Set: 10.0

Doors: 1102A, 1103A, 1116A, 1117A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Office Lock	70 8225 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 PSH	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
3 Silencers	608		RO

Set: 11.0

Doors: 1130A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Storeroom Lock	70 8204 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 PSH	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
3 Silencers	608		RO

Set: 12.0

Doors: 1112A, 1121A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Office Lock	70 8205 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 O10	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Wall Stop	401	US32D	RO
3 Silencers	608		RO

Set: 13.0

Doors: 1118A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Classroom Lock	70 8237 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 O10	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Wall Stop	401	US32D	RO
3 Silencers	608		RO

DOOR HARDWARE

08 71 00

Set: 14.0

Doors: 1111A, 1123A, 1128A, 1131A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Dead Lock	70 4877	US26D	SA
1 Cylinder Core	As required		
1 Pull Plate	111 x 70E x CFC	US32D	RO
1 Push Plate	70F x CFTT	US32D	RO
1 Door Closer	1431 PSH	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
3 Silencers	608		RO

Set: 15.0

Doors: 1107A, 1110A, 1122A, 1124A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Dead Lock	70 4877	US26D	SA
1 Cylinder Core	As required		
1 Pull Plate	111 x 70E x CFC	US32D	RO
1 Push Plate	70F x CFTT	US32D	RO
1 Door Closer	1431 P10	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
1 Wall Stop	401	US32D	RO
3 Silencers	608		RO

Set: 16.0

Doors: 1112B, 1121B

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Office Lock	70 8205 LNL	US32D	SA
1 Cylinder Core	As required		
1 Wall Stop	401	US32D	RO
3 Silencers	608		RO

Note: Verify lock function during keying conference.

Set: 17.0

Doors: 1127A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Classroom Lock	70 8237 LNL	US32D	SA
1 Cylinder Core	As required		
1 Overhead Stop	9ADJ-X26	US26D	RF
3 Silencers	608		RO

Note: Verify lock function during keying conference.

Set: 18.0

Doors: 1108A, 1114A, 1115A, 1119A, 1125A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Privacy Set	V20 8265 LNL	US32D	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
1 Wall Stop	401	US32D	RO
3 Silencers	608		RO

DOOR HARDWARE

08 71 00

Set: 20.0

Doors: 1201A

3 Hinges	TA2314 4.5 x 4.5 NRP	US32D	MK
1 Dormitory Lock	72 8225 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 O10	EN	SA
1 Wall Stop	401	US32D	RO
1 Threshold	171A MSES25SS		PE
1 Sweep	315CN TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 21.0

Doors: 1304A

3 Hinges	TA2314 4.5 x 4.5 NRP	US32D	MK
1 Dormitory Lock	72 8225 LNL	US32D	SA
1 Cylinder Core	As required		
1 Door Closer	1431 CPSH	EN	SA
1 Threshold	171A MSES25SS		PE
1 Sweep	315CN TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 22.0

Doors: 1301A, 1302A

3 Hinges	TA2314 4.5 x 4.5 NRP	US32D	MK
1 Dead Lock	70 4877	US26D	SA
1 Cylinder Core	As required		
1 Pull Plate	111 x 70E x CFC	US32D	RO
1 Push Plate	70F x CFTT	US32D	RO
1 Door Closer	1431 CPSH	EN	SA
1 Kick Plate	K1050 10" x 2" LDW x 4BE CSK	US32D	RO
1 Mop Plate	K1050 6" X 1" LDW 4BE CSK	US32D	RO
1 Threshold	171A MSES25SS		PE
1 Sweep	315CN TEKS		PE
1 Gasketing	303AS TEKS		PE

Set: 23.0

Doors: 1303A

Each to receive:

3 Hinges	TA2714 4.5 x 4.5	US26D	MK
1 Classroom Lock	70 8237 LNL	US32D	SA
1 Cylinder Core	As required		
1 Wall Stop	401	US32D	RO
3 Silencers	608		RO

DOOR HARDWARE

08 71 00

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, and storefront framing.
 - 2. Glazing sealants and accessories.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches (300 mm) square.
 - 1. Clear Tempered glass.
- C. Glazing Accessory Samples: For sealants colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Product Test Reports: For tinted glass coated glass insulating glass glazing sealants, for tests performed by a qualified testing agency.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Preconstruction adhesion and compatibility test report.

- E. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Install glazing in mockups specified in Section 084113 "Aluminum-Framed Entrances and Storefronts" Section 084413 "Glazed Aluminum Curtain Walls" to match glazing systems required for Project, including glazing methods.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Clear Tempered Glass: Manufacturer agrees to replace tempered glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: (10) Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:
 - 1. Manufacturer: Vitro Glass (PPG)
 - 2. Prior-Approved equals.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 - 1. Obtain tinted glass from single source from single manufacturer.
 - 2. Obtain reflective-coated glass from single source from single manufacturer.

- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
1. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 2. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II (unlimited size).
1. Type: Tempered

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of, the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 GLAZING SEALANTS

- A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.

- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 GLASS SCHEDULE

- A. Glass Type **G1**: Clear, fully tempered, float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required at all locations.
- B. Glass Type **G2**: Safety Glass
 - 1. Minimum Thickness: 6mm.
 - 2. Safety glazing required at all locations.
- C. Glass Type **G3**: Impact Resistant Glass
 - 1. Refer to 088819: Hurricane-Resistant Glass

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
 - 1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: Provide a minimum of 25 gage studs for spans less than 12'-0" at 16" O.C., and 20 gage for spans greater than 12'-0".
 - b. Depth: As indicated on Drawings.
 - c. Location: Exterior Walls.
 - 2. Dimpled Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: Provide a minimum of 25 gage studs for spans less than 12'-0" at 16" O.C., and 20 gage for spans greater than 12'-0".
 - b. Depth: As indicated on Drawings.
- C. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch-(13-mm-)wide flanges.
 - 1. Depth: 1-1/2 inches (38 mm).
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch-(1.72-mm-)thick, galvanized steel.
- D. Resilient Furring Channels: 1/2-inch-(13-mm-)deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical.

- E. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch-(13-mm-)wide flanges.
 - 1. Depth: 1 ½ inch.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-)diameter wire, or double strand of 0.048-inch-(1.21-mm-)diameter wire.
- F. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
 - 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track.
 - 3) Steel Network Inc. (The); VertiClip SLD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track.

2.2 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-(1.59-mm-)diameter wire, or double strand of 0.048-inch-(1.21-mm-)diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch-(13-mm-)wide flanges.
 - 1. Depth: 2-1/2 inches (64 mm).
- D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Grid System.
 - c. USG Corporation; Drywall Suspension System.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches (406 mm) o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 4. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

E. Direct Furring:

1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219 mm) o.c.
 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. 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 locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
 - 2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
 - 3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered.

- B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Long Edges: Tapered.
 - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- C. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 - 3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 - 4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
 - 5. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
 - 6. Long Edges: Tapered.
 - 7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 - 1. Core: 5/8 inch (15.9 mm), Type X.
 - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. L-Bead: L-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.
- B. Reveal – Picture Molding
 - 1. Fry Reglet – 3/4", DRMH-50

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.

5. Skim Coat: For final coat of Level 5 finish, usedrying-type, all-purpose compoundhigh-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. 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.
 1. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Thermal Insulation: As specified in Section 07210 "Building Insulation."
- F. Vapor Retarder: As specified in Section 07210 "Building Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-(6.4- to 9.5-mm-)wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-(6.4- to 12.7-mm-)wide spaces at these locations and trim edges with edge trim where

edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Moisture- and Mold-Resistant Type: Install Moisture- and Mold-Resistant Gypsum Board in all areas unless indicated otherwise on Drawings or dictated by other requirements.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Abuse-Resistant Type: As indicated on Drawings.
 - 4. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 5. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 6. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 7. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Single-Layer Application:
 - 1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Curved Surfaces:
 - 1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-(300-mm-)long straight sections at ends of curves and tangent to them.
 - 2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install allocations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. L-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are entirely hidden substrate for acoustical tile.
 3. Level 3: Where indicated on Drawings.
 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 5. Level 5: Where indicated on Drawings.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Porcelain tile.
 - 2. Glazed Wall Tile
 - 3. Tile backing panels.
 - 4. Edge-protection and transition profiles for floors.
 - 5. Finishing and edge-protection profiles for walls and countertops.
 - 6. Movement joint and cove-shaped profiles.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Large Format Tile: Tile with at least one edge 15 inches (381 mm) or longer.
- D. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
- C. Shop Drawings: Provide drawing showing location of all movement joints. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation – Section EJ171" for TCNA movement joint guidelines.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
 - 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
 - 3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
 - 2. Obtain underlayment from manufacturer of setting and grouting materials.
 - 3. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
 - 4. Obtain joint sealants from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Stone thresholds.
 - 2. Waterproof membrane.
 - 3. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Porcelain Tile Type: Unglazed porcelain tile.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Basis of Design: As indicated on finish schedule.
 - 1) Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a) Daltile
 - b) Crossville
 - c) Stonepeak

- d) American Olean
 - e) South Cypress
 - 2. Face Size: As indicated on finish schedule
 - 3. Thickness: As indicated on finish schedule
 - 4. Dynamic Coefficient of Friction: Not less than 0.42.
 - 5. Tile Color, Glaze, and Pattern: As indicated on drawings.
 - 6. Grout Color: As indicated on finish schedule
 - 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cap: Surface bullnose
 - b. External Corners: Surface bullnose, module size
 - c. Internal Corners: Field-buttet square corners.
 - d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4-inch (100-mm) dimension.
- B. Porcelain Tile Type: Large Format Porcelain Tile:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Basis of Design: As indicated on finish schedule.
 - 1) Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a) Daltile
 - b) Crossville
 - c) Stonepeak
 - d) American Olean
 - e) South Cypress
 - 2. Face Size: As indicated on finish schedule
 - 3. Thickness: As indicated on finish schedule
 - 4. Dynamic Coefficient of Friction: Not less than 0.42.
 - 5. Tile Color, Glaze, and Pattern: As indicated on drawings.
 - 6. Grout Color: As indicated on finish schedule
 - 7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cap: Surface bullnose
 - b. External Corners: Surface bullnose, module size
 - c. Internal Corners: Field-buttet square corners.
 - d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4-inch (100-mm) dimension
- C. Glazed Wall Tile Type: Glazed Wall Tile
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Basis of Design: As indicated on finish schedule.
 - 1) Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a) Daltile
 - b) Crossville
 - c) Stonepeak
 - d) American Olean
 - 2. Face Size: As indicated on finish schedule
 - 3. Thickness: As indicated on finish schedule
 - 4. Dynamic Coefficient of Friction: Not less than 0.42.
 - 5. Tile Color, Glaze, and Pattern: As indicated on drawings.

6. Grout Color: As indicated on finish schedule
7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cap: Surface bullnose
 - b. External Corners: Surface bullnose, module size
 - c. Internal Corners: Field-buttet square corners.
 - d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.4 mm) across nominal 4-inch (100-mm) dimension
- D. Square-Edged Quarry Tile Type: Unglazed.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Basis of Design: As indicated on finish schedule.
 - 1) Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a) Daltile
 - b) American Olean
 - c) Crossville
 2. Face Size: As indicated on finish schedule
 3. Thickness: As indicated on finish schedule
 4. Wearing Surface: As indicated on finish schedule
 5. Dynamic Coefficient of Friction: Not less than 0.42.
 6. Finish: As indicated on finish schedule
 7. Tile Color and Pattern: As indicated on finish schedule.
 8. Grout Color: As indicated on finish schedule.
 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved with surface bullnose top edge.

2.4 EDGE-PROTECTION, TRANSITION AND MOVEMENT JOINT PROFILES

- A. Edge-protection and transition profiles: As indicated on drawings
 1. Profile with sloped exposed surface, 5/32 inch (4 mm) tall leading edge, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer. Backfill under profile with thin set per manufacturers guidelines.
 2. Profile with reveal, integrated trapezoid-perforated anchoring leg and integrated grout joint spacer.
- B. Movement joint profiles: As indicated on drawings
 1. Heavy duty surface joint profile with 7/16" (11mm) wide soft thermoplastic rubber movement zone with integrated trapezoid-perforated anchoring legs on both sides.
- C. Thickness: various from 1/8" (2.5mm) – 1/4" (6mm)
- D. Material: Anodized aluminum
- E. Colors: As indicated on finish schedule

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.
 1. Thickness: 5/8 inch (15.9 mm)
 2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.6 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproof Membrane, Sheet: Polyethylene sheet faced on both sides with polyester fabric.
 1. Nominal Thickness: 0.008 inch (0.2 mm)
 2. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Schluter Systems L.P.
- 3. Basis of Design Products:
 - a. Bathroom Flooring Membrane
 - 1) Schluter Kerdi Membrane Roll
 - b. Bathroom Base Underlayment
 - 1) Schluter Kerdi Membrane Strip

2.7 UNCOUPLING MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Corrugated Polyethylene Uncoupling Membrane: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 1/8-inch (3-mm) nominal thickness.
 - a. Basis of Design Product: Ditra by Schluter Systems

2.8 SETTING MATERIALS

- A. Dry-Set Portland Cement Mortar (Thinset): ANSI A118.1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
Basis of Design: Custom Building Products MegaLite
 - 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
- B. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
 - 4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- C. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified by manufacturer for intended use.

2.9 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Custom Building Products
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
- C. High-Performance Tile Grout: ANSI A118.7.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Custom Building Products
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
 - 2. Polymer Type:
 - a. Dry, redispersible form, prepackaged with other dry ingredients.
 - b. Liquid-latex form for addition to prepackaged dry-grout mix.
- D. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Custom Building Products
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified by manufacturer for intended use.

2.10 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils (0.1 mm) thick.
- C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel exposed-edge material.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Grout Sealer: Manufacturer's standard product for sealing grout joints and providing stain resistance and that does not change color or appearance of grout.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Laticrete
 - b. Mapei
 - c. TEC

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1 and is sloped 1/4 inch per foot (1:50) toward drains.

- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- D. Mix mortars and grouts to comply with "Referenced Standards" Article in the Evaluations and mortar and grout manufacturers' written instructions.
1. Add materials, water, and additives in accurate proportions.
 2. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
- E. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors and walls.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
 - f. Tile floors consisting of rib-backed tiles.
 2. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
 3. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
 4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
 6. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets, so joints between sheets are not apparent in finished Work.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- F. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- G. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation – Section EJ171" for TCNA movement joint guidelines

- H. Thresholds: Install stone and solid surface thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- I. Metal Flooring Transitions: Install at locations indicated
- J. Metal Wall Trim: Install at locations indicated on Drawings.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 LARGE FORMAT TILE INSTALLATION

- A. Large Format Tile is tile with a dimensional length greater than 15 inches on any one side of tile
 - 1. Tile must be installed on a level substrate.
 - 2. Provide a minimum of 90% mortar contact
 - 3. Grout Joints: Tile should be installed in accordance per the manufacturers grout joint recommendations.
 - 4. Setting Materials: medium bed mortar
 - 5. Back butter tiles to assure proper coverage for bonding.

3.5 TILE BACKING PANEL INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.6 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Extend waterproofing membrane 6" minimum up the face of walls.
- D. Locations:
 - 1. All rest rooms with adjacent metal stud walls.

3.7 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.8 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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

This Section includes the following:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 1. 6-inch- (150-mm-) square samples of each acoustical panel type, pattern, and color.
 2. Set of 12-inch- (300-mm-) 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 completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
 1. Obtain both acoustical ceiling panels and suspension system from the same manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
 2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
 3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
 4. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Acoustical Panel Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
- C. Antimicrobial Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial solution consisting of a synergistic blend of substituted ammonium salts of alkylated phosphoric acids admixed with free alkylated phosphoric acid that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria.
- D. Panel Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
 - 1. Postinstalled Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
- E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- F. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For interior ceilings consisting of acoustical panels weighing less than 1 lb/sq. ft. (4.88 kg/sq. m), provide hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.
- G. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including gasket type indicated below, and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.
 - 1. Gasket Type: Neoprene.

2.4 METAL EDGE MOLDINGS AND TRIM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:
1. Extruded Aluminum Perimeter Trim at Suspended Acoustical Panel Clouds:
 - a. Armstrong Axiom Classic Trim
 - 1) Height: 4"
 - 2) Color: White
 - 3) Corners: Preformed
 - 4) Locations: At all suspended acoustical panel clouds at heights less than 15'-0".
 2. Extruded Aluminum Perimeter Trim at Suspended Acoustical Panel Clouds:
 - a. Armstrong Axiom Classic Trim
 - 1) Height: 8"
 - 2) Color: White
 - 3) Corners: Preformed
 - 4) Locations: At all suspended acoustical panel clouds at heights 15'-0" or greater.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.
 2. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.5 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. PL Acoustical Sealant; Chemrex, Inc., Contech Brands.
 - b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - c. SHEETROCK Acoustical Sealant; United States Gypsum Co.
 2. Acoustical Sealant for Concealed Joints:
 - a. BA-98; Pecora Corp.
 - b. Tremco Acoustical Sealant; Tremco, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
 - 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
 - 3. U.B.C.'s "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings": U.B.C. Standard 25-2.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with 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 and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not attach hangers to steel deck tabs.
 - 6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 7. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member. Place hangers on all four corners of fixtures and equipment (not on grid) supported by suspension system.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels with pattern running in one direction parallel to long axis of space.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 - 3. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.
 - 5. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
 - 6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 ACOUSTICAL PANEL CEILING AND SUSPENSION SYSTEM SCHEDULE

- A. Typical ceiling tile: Provide where scheduled as "AC-PNL".
 - 1. AC-PNL-A: At all locations not otherwise indicated
 - a. Panel Option A: Armstrong Ultima High NRC Square Lay-In #1940, NRC: 0.80, Armstrong World Industries, Inc.
 - 1) Size: 24 by 24 inches (610 by 610 mm).
 - 2) Color: White.
 - b. Panel Option B: USG Mars High-NRC #86100, USG Corporation, Inc.
 - 1) Size: 24 by 24 inches (610 by 610 mm).
 - 2) Color: White.
 - c. Suspension System: Main and cross runners roll formed from cold-rolled steel sheet hot dipped galvanized, with prefinished 15/16-inch- (24-mm-) wide flanges; other characteristics as follows:
 - 1) Armstrong, Prelude XL 15/16-inch Exposed Tee or USG, Donn Brand DX/DXL 15/16-inch Exposed Tee or equivalent.
 - 3) Face Finish: Painted white.
 - 2. AC-PNL-B:
 - a. Panel: Vinyl covered gypsum wallboard,
 - 1) Size: 24 by 24 inches (610 by 610 mm).
 - 2) Color: White.
 - b. Suspension System: Main and cross runners roll formed from cold-rolled steel sheet hot dipped galvanized, with prefinished 15/16-inch- (24-mm-) wide flanges; other characteristics as follows:
 - 1) Armstrong, Prelude XL 15/16-inch Exposed Tee or USG, Donn Brand DX/DXL 15/16-inch Exposed Tee or equivalent.
 - 2) Structural Classification: Intermediate-duty system.
 - 3) Face Finish: Painted white.
 - 3. AC-PNL-C:
 - a. Panel Option A: Armstrong Cortega #770, Armstrong World Industries, Inc.
 - 1) Size: 24 by 24 inches (610 by 610 mm).
 - 2) Color: White.
 - b. Panel Option B: USG Radar #2110, USG Corporation, Inc.
 - 1) Size: 24 by 24 inches (610 by 610 mm).
 - 2) Color: White.
 - c. Suspension System: Main and cross runners roll formed from cold-rolled steel sheet hot dipped galvanized, with prefinished 15/16-inch- (24-mm-) wide flanges; other characteristics as follows:
 - 1) Armstrong, Prelude XL 15/16-inch Exposed Tee or USG, Donn Brand DX/DXL 15/16-inch Exposed Tee or equivalent.
 - 2) Structural Classification: Intermediate-duty system.
 - 3) Face Finish: Painted white.

3.6 ACOUSTICAL CEILING SCHEDULE

- A. Acoustical Baffle: Provide where scheduled as "AC-BAF".
 - 1. AC-BAF-A:
 - a. Armstrong World Industries, TURF Design Inc.
 - 1) Size: varies, see ceiling plan
 - 2) Color: Charcoal 06
 - 3) Style: Ridge
 - 4) Acoustical Performance: ASTM C 423-17: Type J

- 5) Fire Rating: Class A
- 6) Suspension Kit includes installation hardware and cables
- 7) Location: Lobby 1101

B. Acoustical Baffle: Provide where scheduled as "AC-CLG"

1. AC-BAF-B

a. Armstrong World Industries, TURF Design Inc.

- 1) Size: varies, see ceiling plan
- 2) Color: Azure 31
- 3) Style: Ridge
- 4) Acoustical Performance: ASTM c 423-17: Type J
- 5) Fire Rating: Class A
- 6) Suspension Kit includes installation hardware and cables
- 7) Location: Lobby 1101

END OF SECTION 095113

SECTION 096466 - WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes wood athletic flooring.

1.3 COORDINATION

- A. Coordinate layout and installation of slab depressions to accommodate layout and height of wood athletic flooring assembly.
- B. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- B. Shop Drawings: For each type of floor assembly, include the following:
 - 1. Plans, sections, and attachment details.
 - 2. Details of concrete-slab depressions.
 - 3. Locations of different grades of wood flooring.
 - 4. Expansion provisions and trim details.
 - 5. Layout, colors, widths, and dimensions of game lines, markers, and logo graphics.
 - 6. Locations of floor inserts for athletic equipment installed through flooring assembly.
- C. Samples: For each exposed product and for each color and texture specified, approximately 12 inches (300 mm) long in size.
 - 1. Include Sample sets showing the full range of normal color and texture variations expected in wood flooring.
 - 2. Include Sample sets showing finishes and game-line and marker paints applied to wood flooring.
- D. Samples for Initial Selection: For each type of wood athletic flooring and accessory in each type of exposed color and finish.
 - 1. Include manufacturer's color charts showing colors and glosses available for the following:
 - a. Floor finishes.
 - b. Game-line and marker paints.
- E. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work.
 - 1. Include Sample sets showing the full range of normal color and texture variations expected in wood flooring.
 - 2. Include Sample sets showing finishes and game-line and marker paints applied to wood flooring.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wood athletic flooring system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer according to the MFMA Accreditation Program.
 - 1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver floor assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet-work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.

1.9 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.
 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood athletic flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Basis of Design: Robbins – Bio-Channel SB, 1-3/4" System
 2. Acer Sports Flooring.
 3. Action Floor Systems, LLC.
 4. Conner Sports Surface Solutions.

2.2 VAPOR RETARDER

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils (0.15 mm) thick.

2.3 SUBFLOOR SYSTEM

- A. Robbins Lineal Zero/G™ shock pad or equal factory-prepared subfloor panels
 1. 7/16" factory engineered system
- B. Bio-Channel SB Subfloor panels that have been factory-prepared to accept anchor channel and lineal strips or equal factory-prepared subfloor panels.
- C. 16 gauge coated metal anchor channels.

2.4 FLOORING MATERIALS

- A. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.
- B. Random-Length Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, finger-jointed, tongue and groove, and end matched. Wood to be FSC certified lumber.
 1. Grade: MFMA-RL First.
 - a. Exception: For areas under stacked portion of telescoping bleachers that are normally concealed from view, provide Third and Better Grade.
 2. Cut: Mixed Grain.
 3. Thickness: 25/32 inch (20 mm).
 4. Face Width: 2-1/4 inches (57 mm).

2.5 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: MFMA Group 3, Gymnasium-Type Surface Finishes.
 - 3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.

2.6 ACCESSORIES

- A. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 by 3 by 48 inches (100 by 75 by 1200 mm); with premolded outside corners and neatly mitered inside corners.
 - 1. Color: Black.
- B. Fasteners
 - 1. Flooring – 1-3/4" (44mm) cleats or staples.
 - 2. Channel anchors as per manufacturer's recommendations.
- C. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood athletic flooring manufacturer.
- D. Adhesives: Manufacturer's standard for application indicated.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Concrete Slabs:
 - 1. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
 - 2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
 - 3. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- B. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.
- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.

1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped and sealed a minimum of 6 inches (150 mm), turned up 4" at the walls.
- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. Subfloor
 1. Install shock absorbing pads per manufacturer's recommendations.
 2. Install the subfloor assembly placed on a 45° angle to the intended finish flooring direction, staggering end joints in adjacent rows. All joints shall be staggered 4' and spaced ¼" (6mm) apart. Provide 1-1/2" to 2" (40mm to 50mm) expansion void at the perimeter and all vertical obstructions.
 3. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
 4. Install Bleacher Blocking per manufacturer's recommendations.
 5. Place metal anchor channel in each factory-prepared location in the panel.
 6. Anchor each anchor channel in the center of the pre-routed hole only, unless trimming at wall or vertical obstruction requires relocation in adjacent location to anchor.
- G. Strip Flooring: Machine nail maple finish flooring 10" to 12" (150mm to 200mm) O.C. with end joints properly driven up and proper spacing provided for humidity conditions in specific regions. Provide 2" (50mm) expansion voids at the perimeter and at all vertical obstructions.
- H. Installation Tolerances: 1/8 inch in 10 feet (3 mm in 3 m) of variance from level.

3.4 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than two finish coats.
 1. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. The floor shall be marked in accordance with Alabama High School Athletic Association guidelines as follows:
 - 1) As outlined on Pages 6, 7 and 8 of the National Federation Basketball Rules books.
 - 2) Include "coaching boxes" in accordance with Rule 1-13-2 adopted by the AHSAA.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.5 PROTECTION

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.
 1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
 2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096466

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset rubber base.
 - 2. Thermoplastic-rubber base.
 - 3. Rubber molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: Provide two (2) samples for each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size samples

1.4 MAINTENANCE 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. Furnish not less than 25 linear feet for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Basis of Design: As indicated on finish schedule.
 - a. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Tarkett
 - 2) Roppe
 - 3) Flexco
- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 1. Style and Location:
 - a. Style B, Cove: Provide in areas indicated on drawings.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: As indicated on finish schedule.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors: As indicated on finish schedule.

2.2 THERMOPLASTIC-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Basis of Design: As indicated on finish schedule.
 - a. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Tarkett
 - 2) Roppe
 - 3) Flexco
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 1. Group: I (solid, homogeneous).
 2. Style and Location:
 - a. Style D, Sculptured: Provide in areas indicated on drawings.
 - 1) Profile: As indicated on finish schedule.
- C. Thickness:
 1. Sculptured - 0.25 inch.
- D. Height: As indicated on finish schedule.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed
- G. Inside Corners: Job formed
- H. Colors: As indicated on finish schedule.

2.3 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. As indicated on finish schedule
- B. Description: Rubber stair-tread nosing, nosing for carpet, nosing for resilient flooring, reducer strip for resilient flooring, joiner for tile and carpet, and transition strips
- C. Profile and Dimensions: As indicated on drawings.
- D. Locations: Provide rubber molding accessories in areas indicated on drawings.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.

- a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 2. Tightly adhere to substrates throughout length of each piece.
 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum horizontal surfaces thoroughly.
 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Luxury vinyl floor tile.
 - 2. Edge-protection and transition profiles for floors.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Basis of Design: As indicated on finish schedule.
 - a. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Tarkett
 - 2) Mohawk Industries
 - 3) Shaw Industries Group, Inc.
 - 4) Mannington Commercial
 - 5) J&J Flooring
 - 6) Bentley Mills
 - 7) Interface
 - 8) Teknoflor
- B. Tile Standard: ASTM F 1700.
 - 1. Class: Class III, printed film vinyl tile.
 - 2. Type: A, smooth surface and B, embossed surface.
- C. Thickness: As indicated on finish schedule
- D. Wear Layer Thickness: As indicated on finish schedule
- E. Size: As indicated on finish schedule.
- F. Colors and Patterns: As indicated on finish schedule.

2.3 EDGE-PROTECTION AND TRANSITION PROFILES FOR FLOORS

- A. Edge-protection and transition profiles for floors: As indicated on drawings
 - 1. Profile with reveal and tapered anchoring leg for smooth transition between substrate and profile
- B. Thickness: various from 1/8" (2.5mm) – 1/4" (6mm)
- C. Material: Anodized aluminum
- D. Colors: As indicated on finish schedule

2.4 INSTALLATION MATERIALS

- A. Leveling and Patching Compounds:
 - 1. Trowelable - Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
 - a. Basis of Design: Ardex Feather Finish, or equal.
 - 2. Self-Leveling – Portland cement based formulation provided or approved by resilient product manufacturer for applications indicated.
 - a. Basis of Design: Schonox DSP, or equal
 - b. Installation in all areas to receive new LVT flooring.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resinous flooring
 - 2. Integral cove base accessories

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review manufacturer's written instructions for substrate preparation and environmental conditions affecting resinous flooring installation.
 - 2. Review details of integral cove bases.
 - 3. Review manufacturer's written instructions for installing resinous flooring systems.
 - 4. Review protection measures for adjacent construction and installed flooring, floor drainage requirements, curbs, base details, and so forth.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
 - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Provide 150 SF mock up to be reviewed and approved by architect/designer prior to final installation. Include floor & base application. Location of mock-up to be determined by Owner in coordination with GC.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Flammability: Self-extinguishing according to ASTM D635.

2.2 RESINOUS FLOORING

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
 - 1. Acceptable Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. BASF Corporation.
 - b. Duraflex, Inc.
 - c. ROCK-TRED Corporation.
 - d. Sherwin-Williams Company, General Polymers.
 - e. Sika Corporation; Flooring.
 - f. Stonhard, Inc.
 - 2. Manufacturer of Approved System shall be single source and made in the USA.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.
- C. System Characteristics:
 - 1. Color and Pattern: As selected by Architect from manufacturer's full range.
 - 2. Wearing Surface: Textured for slip resistance.
 - 3. Overall System Thickness: 40-120 mils (1-3mm).
- D. Primer: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.
- E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended in writing by manufacturer for installation indicated.

2.3 INTEGRAL COVE BASE ACCESSORIES

- A. Precast, Integral Cove Base: Impact-resistant, polymer-resin, cove base moldings with a grit profile to promote adhesion of resinous flooring and recommended in writing by resinous flooring manufacturer.
 - 1. Radius Cove: Cove molding with approximately 1-inch (25-mm) radius for adhesive installation at floor-to-wall joint as substrate to receive resinous flooring system to form an integral cove base.
 - 2. Radius Cove Base: 6-inch high base molding that provides approximately 1-inch (25-mm) radius cove at floor-to-wall joint; for adhesive installation as substrate for resinous flooring system to form an integral cove base.
 - a. Preformed Inside and Outside Corners: Provide manufacturer's standard square inside and 3/4- to 1-inch (19- to 25-mm) bullnose outside corners.
- B. Installation Adhesive: As recommended in writing by accessory manufacturer.

2.4 WATERPROOF MEMBRANE

- A. Waterproofing Membrane: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.
 - 1. Products: Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Stonhard - Stonseal MP7
 - b. Schluter Systems - KERDI Bonded Waterproofing and vapor-retardant membrane

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resinous flooring systems.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Roughen concrete substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with NACE No. 6/SSPC-SP13, with a Concrete Surface Profile (CSP) of 3 or greater in accordance with the International Concrete Repair Institute (ICRI) Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 - 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
 - 1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.3 INSTALLATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Substrate Temperature: Do not attempt to install material if the temperature of components and substrate are not within 60 to 85°F/16 to 30°C. The cure time and application properties of the material will be severely affected.
- C. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- D. Integral Cove Base Accessories: Adhesively install precast accessories before applying flooring coats and in accordance with manufacturer's written instructions.
- E. Field-Formed Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring coats. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
 - 1. Integral Cove Base: 6 inches high.
- F. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
 - 1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.
- G. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.

- H. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.
- I. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface specified.

3.4 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
 - 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 - 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove non-complying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.5 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

3.6 RESINOUS FLOORING SYSTEM SCHEDULE

- A. Typical resinous flooring: Provide where scheduled as "RSF".
 - 1. RSF-1: At all locations indicated on finish schedule.
 - a. Basis of Design: Sherwin Williams Resufloor Deco Flake SB
 - 1) Color and Pattern: As indicated on finish legend.
 - 2) Wearing Surface: Standard
 - a. Location: Restrooms, Locker Rooms, Corridor, and Vestibule (see drawings)
 - 3) Wearing Surface: Standard with 90# grit white aluminum oxide or 60# grit silica aggregate for slip resistance per manufacturer's recommendations
 - a. Location: Showers (see drawings)
 - 4) Overall System Thickness: 2mm
 - b. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - 1) Primer: Resufloor MPE @ 300-500 sq.ft per gallon
 - 2) Body Coat: Resufloor MPE @ 200-300 sq ft per gallon
 - 3) Broadcast: Decorative Flakes 6750 or 6755 to excess at 100-200 lbs per 1000 sq ft.
 - 4) Grout Coat: Resufloor MPE @ 150-250 sq ft per gallon
 - 5) Seal Coat: Resutile HPS 100 @ 400-500 sq ft per gallon
 - c. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:
 - 1) Abrasion Resistance: 63 mgs lost in accordance with ASTM D-4060, CS-17 Wheel, 1,000 cycles.
 - 2) Flexural Strength: 10,000 psi per ASTM C-580.
 - 3) Adhesion: 300 psi concrete failure in accordance with ACI 503R.
 - 4) Flammability: Self-Extinguishing over concrete.
 - 5) Impact Resistance: Direct, inch pound greater than 160, passes Reverse, inch pound greater than 80, passes in accordance with MIL-D-3134J.
 - 6) Resistance to Elevated Temperature: No slip or flow at required temperature of 158 degrees Fahrenheit in accordance with MIL-D-3134J.

END OF SECTION 096723

SECTION 098403 - ACOUSTIC ROOM COMPONENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Sound-Absorbing Wall Panels

1.2 SCOPE OF WORK

- A. Material Locations: Provide material in locations as follows:
 - 1. AWP-A:
 - a. 1106 Court as shown on drawings

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Installation method.
 - 2. Manufacturer's data: Submit the results of laboratory tests performed by a recognized independent acoustical testing laboratory indicating that a laboratory installation of the panels has met or exceeded the Noise Reduction Coefficient (NRC) values listed in this specification for each thickness/density used.
- B. Shop drawings:
 - 1. Submit shop drawings indicating plans, elevations, hardware and attachment details, including dimensions.
 - 2. Submit material and finish system data and maintenance data for retention of specified acoustic performance.
 - 3. Show orientation of fabric and wood veneer application, pattern matching, and seams.
- C. Verification Samples: For each product specified, provide a sample, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
- C. Do not deliver material to building until wet-work, such as concrete and plaster, has been completed and cured to a condition of equilibrium.
- D. Store products in manufacturer's unopened packaging until ready for installation.
 - 1. Store materials flat, in dry, well-ventilated space.
 - 2. Do not stand panels on end.
 - 3. Protect panel edges from crushing and impact.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.6 WARRANTIES

- A. The panel assemblies shall be warranted against defective workmanship, delamination of finishes or hardware and defective materials for a period of two years from date of final acceptance.
- B. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:
 - a. Acoustical performance.

- b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 SOUND ABSORBING PANELS

- A. AWP-A - IMPACT RESISTANT SOUND ABSORBING PANEL: Manufacturer's standard impact resistant panel construction consisting of facing material stretched over edge-reinforced, multi-layer glass fiber core and bonded or attached to edges and back of panel and complying with the following:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Kinetics Noise Control; High Impact Hardside Panels or comparable product by the following:
 - a. Conwed - Respond HI
 - b. AcousTech - High-Impact by AVL Systems, Inc.
 - c. G&S Acoustics - Acousti-Impact Wall Panels
 2. Panel Shape: Flat
 3. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
 4. Composition: 1/8" thick, high density (20 pounds per cubic foot) glass fiber board lightly bonded to a medium density (6-7 pounds per cubic foot), dimensionally stable, glass fiber board. Chemically hardened edges.
 5. Edge Detail: As selected by Architect from manufacturer's standard.
 6. Facing: Unbacked woven fabric. Provide scrim fabric as required.
 7. Acoustical Performance: NRC Not less than .95
 8. Nominal Thickness: 2".
 9. Size and Locations: As indicated in drawings and approved by Architect based on shop drawing submittals
 10. Color/Pattern: Material, color, pattern, and texture as selected by Architect.

2.3 MATERIALS

- A. Core Materials: Manufacturer's standard.
1. Glass-Fiber Board: ASTM C 612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
 2. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively; minimum density of 13 lb/cu. ft., and with perforated surface.
 3. Cementitious-Fiber Board: Density of not less than 20 lb/cu. ft.
 4. Fire-Retardant Formed Plastic: Manufacturer's standard formed plastic with flame-spread index of 25 or less and smoke-developed index of 25 or less according to ASTM E 84 or UL 723.
 5. Medium-Density Fiberboard: Panels complying with ANSI A208.2, grade to suit performance requirements.
 - a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84 or UL 723.
 6. Particleboard: Panels complying with ANSI A208.1, grade to suit performance requirements.

- a. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84 or UL 723.
- B. Facing Material: Fabric from same dye lot; color and pattern as indicated on Drawings.
- C. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:
 - 1. Splines: Manufacturer's standard concealed metal or plastic splines that engage the kerfed edges of the unit, with other moldings and trim for interior corners, exterior corners, and exposed edges, with factory-applied finish on exposed items.
 - 2. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 EXAMINATION

- A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align fabric pattern and grain as indicated on Drawings.
- D. Provide all necessary accessories and hardware to effect proper and complete installation.

3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm) in 48 inches (1200 mm), noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch (1.6-mm) variation from hairline in 48 inches (1200 mm), noncumulative.

3.5 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

3.6 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION 098403

SECTION 099123 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. Wood.
 - 7. Gypsum board.
 - 8. Plaster.
- B. Related Sections include the following:
 - 1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 6 Sections for shop priming carpentry with primers specified in this Section.
 - 3. Division 9 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 4. Division 9 Section "Wood Stains and Transparent Finishes" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
 2. PPG Architectural Finishes, Inc.
 3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As indicated in a color schedule.

2.3 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI #4.
1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: MPI #50.
1. VOC Content: E Range of E2.
 2. Environmental Performance Rating: EPR 2.
- B. Interior Alkyd Primer/Sealer: MPI #45.
1. VOC Content: E Range of E2.

2.5 METAL PRIMERS

- A. Quick-Drying Alkyd Metal Primer: MPI #76.
1. VOC Content: E Range of E2.
- B. Cementitious Galvanized-Metal Primer: MPI #26.
1. VOC Content: E Range of E2.

2.6 LATEX PAINTS

- A. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
1. VOC Content: E Range of E2.
 2. Environmental Performance Rating: EPR 2.
- B. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
1. VOC Content: E Range of E2.
 2. Environmental Performance Rating: EPR 2.

2.7 ALKYD PAINTS

- A. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).
1. VOC Content: E Range of E2.

2.8 FLOOR COATINGS

- A. Interior/Exterior Clear Concrete Floor Sealer (100% acrylic resin): Richard's Paver-Seal
1. VOC Content: E Range of E2.
- B. Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).
1. VOC Content: E Range of E2.
 2. Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
 - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Aluminum Substrates: Remove surface oxidation.
- I. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- J. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- K. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Latex Over Sealer System: MPI INT 3.1A.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (eggshell).
- B. Concrete Substrates, Traffic Surfaces:
 - 1. Alkyd Floor Enamel System: MPI INT 3.2B.
 - a. Prime Coat: Exterior/interior alkyd floor enamel (gloss).
 - b. Intermediate Coat: Exterior/interior alkyd floor enamel (gloss).
 - c. Topcoat: Exterior/interior alkyd floor enamel (gloss).
 - 2. Clear Sealer System: MPI INT 3.2F.
 - a. First Coat: Interior/exterior clear concrete floor sealer (solvent based).
 - b. Topcoat: Interior/exterior clear concrete floor sealer (solvent based).
- C. CMU Substrates:
 - 1. Latex System: MPI INT 4.2A.
 - a. Prime Coat: Interior/exterior latex block filler.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (semigloss).

- D. Dry Interior Overheads, Gymnasium Service: (Mild, Climate Controlled Exposures): Carbon Steel, Galvanized Steel, Primed Metal Joists, Wood, Concrete, and HVAC.
 - 1. Primer/Finish: 2 Coats of DevGuard 4308 Alkyd Industrial Gloss Enamel or equal.
 - a. Dry Film Thickness: 2.0-4.0 mils/coat.
- E. Steel Substrates:
 - 1. Alkyd System: MPI INT 5.1E.
 - a. Prime Coat: Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (gloss).
- F. Galvanized-Metal Substrates:
 - 1. Alkyd System: MPI INT 5.3C.
 - a. Prime Coat: Cementitious galvanized-metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (gloss).
- G. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - 1. Alkyd Over Quick-Drying Primer System: MPI INT 5.4J.
 - a. Prime Coat: Quick-drying primer for aluminum.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (gloss).
- H. Gypsum Board Substrates:
 - 1. Latex System: MPI INT 9.2A.
 - a. Prime Coat: Interior latex primer/sealer matching topcoat.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (eggshell).

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

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 surface preparation and the application of high-performance coating systems.
 - 1. Exterior Substrates:
 - a. Steel.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of structural steel with primers specified in this Section.
 - 2. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings with coatings specified in this Section.
 - 3. Section 099113 "Exterior Painting" for general field painting.
 - 4. Section 099123 "Interior Painting" for general field painting.

1.3 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Devoe High Performance Coatings.
 2. PPG Paints; PPG Industries, Inc.
 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 3. Products shall be of same manufacturer for each coat in a coating system.
- C. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- C. Plaster Substrates: Verify that plaster is fully cured.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- I. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:
 - 1. Pigmented Polyurethane over High-Build Epoxy System MPI EXT 5.1J:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
 - b. Intermediate Coat: Epoxy, high build, semi-gloss, MPI #108, Basis of Design:
 - 1) Devoe Bar-Rust 235 or approved equal.
 - c. Topcoat: Polyurethane, two component, pigmented, gloss (MPI Gloss Level 6)[, MPI #72], Basis of Design:
 - 1) Devoe Devthane 379 or approved equal.

END OF SECTION 099600

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Markerboards.
- B. Related Sections include the following:
 - 1. Division 10 Section "Bulletin Boards and Display Cases" for bulletin boards in built-in trophy and display cases.

1.3 DEFINITIONS

- A. Visual Display Boards: markerboards and tackboards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show location of panel joints.
 - 2. Include sections of typical trim members.
- C. Samples for Initial Selection: For each type of visual display surface indicated and as follows:
 - 1. Actual sections of porcelain-enamel face sheet and tack assembly.
 - 2. Fabric swatches of vinyl-fabric-faced tack assemblies.
 - 3. Samples of accessories involving color selection.
- D. Samples for Verification: For each type of visual display surface indicated and as follows:
 - 1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch- (152-mm-) long sections of each trim profile.
- E. Qualification Data: For Installer.
- F. Maintenance Data: For visual display surfaces to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- C. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display units vertically with packing materials between each unit.

1.7 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces become slick or shiny.
 - c. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Porcelain-Enamel Face Sheet: Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.0236-inch (0.60-mm) uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F (538 deg C).
 1. Gloss Finish: Low gloss; dry-erase markers wipe clean with dry cloth or standard eraser. Suitable for use as projection screen.
- B. Hardboard: AHA A135.4, tempered.
- C. Particleboard: ANSI A208.1, Grade 1-M-1, made with binder containing no urea formaldehyde.
- D. Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
- E. Plastic-Impregnated Cork Sheet: MS MIL-C-15116-C, Type I, seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto burlap backing; with washable vinyl finish and integral color throughout.
- F. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.
- G. High-Pressure Plastic Laminate: NEMA LD 3.

2.2 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and porcelain-enamel face sheet with low-gloss finish.
 1. Available Manufacturers:
 - a. Best-Rite Manufacturing.
 - b. Claridge Products & Equipment, Inc.
 - c. PolyVision Corporation.
 2. Manufacturer's Standard Core: Minimum 1/4 inch (6 mm) thick, with manufacturer's standard moisture-barrier backing.
 3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.3 TACK ASSEMBLIES

- A. Plastic-Impregnated-Cork Tack Assembly: 1/4-inch- (6-mm-) thick, plastic-impregnated cork sheet factory laminated to 1/4-inch- (6-mm-) thick hardboard backing.

2.4 MARKERBOARD AND TACKBOARD ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; of size and shape indicated.
 1. Factory-Applied Trim: Manufacturer's standard.
 2. Location: Locker Rooms

2.5 FABRICATION

- A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.
- B. Visual Display Boards: Factory assemble visual display boards, unless otherwise indicated.
 1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.
- C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
- D. Visual Display Wall Panels: Fabricate panels with 0.0209-inch- (0.55-mm-) thick, porcelain-enamel face sheets.
- E. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.6 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.
- C. Examine walls and partitions for proper backing for visual display surfaces.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.
- B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

3.3 INSTALLATION, GENERAL

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
 1. Mounting Height: 36 inches (914 mm) above finished floor to top of chalktray.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

- A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.

3.5 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 101423 - ROOM-IDENTIFICATION PANEL SIGNAGE

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 room-identification signs that are directly attached to the building.
- B. Related Requirements:
 - 1. Section 101416 "Plaques" for one-piece, solid metal signs, with or without frames, that are used for high-end room-identification.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Room-Identification Signs: Full-size Sample.
 - 2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 3. Exposed Accessories: Full-size Sample of each accessory type.
 - 4. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. APCO Graphics, Inc.
 - b. Best Sign Systems, Inc.
 - c. Clarke Systems.
 - d. Mohawk Sign Systems.
 2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied Graphics: Applied vinyl film.
 - c. Subsurface Graphics: Slide-in changeable insert.
 - d. Color(s): As selected by Architect from manufacturer's full range.
 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: As indicated on Drawings.
 - b. Corner Condition in Elevation: As indicated on Drawings.
 4. Mounting: Surface mounted to wall with two-face tape.
 5. Text and Typeface: typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
 1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner.
 2. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
 1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423.16

SECTION 102113- PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.
 - 2. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of centerlines of toilet fixtures.
 - 3. Show locations of floor drains.
 - 4. Show overhead support or bracing locations.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. All materials must comply with NFPA 286.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Basis of Design: As indicated on finish schedule.

- a. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Scranton Products
 - 2) ASI Accurate Partitions
 - 3) Hadrian
 - 4) Bradley Corp.
 - 5) General Partitions
- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Overhead braced.
- D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 1. Heat-Sink Strip: Manufacturer's standard continuous, stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
 2. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.
- E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; polymer.
 1. Polymer Color and Pattern: Matching pilaster.
- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe and sleeve (cap) matching that on the pilaster.
- G. Brackets (Fittings):
 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 1. Hinges: Manufacturer's minimum 0.062-inch-(1.59-mm-)thick stainless-steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
 5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless-Steel Castings: ASTM A 743/A 743M.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-(610-mm-)wide, in-swinging doors for standard toilet compartments and 36-inch-(914-mm-)wide, out-swinging doors with a minimum 32-inch-(813-mm-)wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Childcare accessories.
 - 4. Custodial accessories.
- B. Related Requirements:
 - 1. Division 10 Section "Toilet Compartments" for compartments and screens.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. If applicable, include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals. Provide lists of replacement parts and service recommendations.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.8 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents
- B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

- C. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED, CONTRACTOR INSTALLED MATERIALS

- A. Owner-Furnished, Contractor Installed Materials:
1. Toilet Tissue Dispenser
 2. Paper Towel Dispenser
 3. Soap Dispenser

2.2 PERFORMANCE REQUIREMENTS

- 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. Structural Performance: Design accessories and fasteners to comply with the following requirements:
1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.
 2. Shower Seats: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Manufacturers:
1. Subject to compliance with requirements, provide products by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc
 - c. Bradley Corporation
 - d. Brey-Krause Manufacturing Co.
 - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
- C. Grab Bar :
1. Basis-of-Design Product: Bobrick B-6806 Series
 2. Mounting: Flanges with concealed fasteners.
 3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 4. Outside Diameter: 1-1/2 inches (38 mm).
 5. Configuration and Length: As indicated on Drawings.
- D. Mirror Unit :
1. Basis-of-Design Product: Bobrick B-165
 2. Frame: Stainless steel channel.
 - a. Corners: Manufacturer's standard.
 3. Size: As indicated on Drawings.
 - a. All above sink mirror units to be 24x36, unless otherwise noted
 4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.
- E. Hook :
1. Basis-of-Design Product: Bobrick B-211
 2. Description: Single-prong unit.
 3. Mounting: Exposed.
 4. Material and Finish: brass with satin nickel-plated finish.

2.4 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain public-use shower room accessories from single source from single manufacturer.
- B. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc
 - c. Bradley Corporation
 - d. Brey-Krause Manufacturing Co.
 - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
- C. Shower Curtain Rod :
 - 1. Basis-of-Design Product: Bobrick B-207
 - 2. Description: 1-inch- (25.4-mm-) OD, straight rod.
 - 3. Configuration: As indicated on Drawings.
 - 4. Mounting Flanges: Concealed fasteners; in manufacturer's standard material and finish.
 - 5. Rod Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- D. Shower Curtain & Hooks :
 - 1. Basis-of-Design Product: Bobrick 204
 - 2. Size: Minimum 12 inches (305 mm) wider than opening by 72 inches (1829 mm) high. Verify widths with plans.
 - 3. Material: Vinyl, minimum 0.006 inch (0.15 mm) thick, opaque, matte.
 - 4. Color: As selected from manufacturer's full range.
 - 5. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
 - 6. Shower Curtain Hooks: stainless steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
- E. Folding Shower Seat :
 - 1. Basis-of-Design Product: Bobrick B-5181
 - 2. Configuration: L-shaped seat, designed for wheelchair access.
 - 3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect; 0.5-inch (13-mm) minimum nominal thickness; with single-piece, pan-type construction and edge seams welded and ground smooth.
 - 4. Mounting Mechanism: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.5 CHILDCARE ACCESSORIES

- A. Source Limitations: Obtain childcare accessories from single source from single manufacturer.
- B. Diaper-Changing Station :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. Bradley Corporation
 - c. Diaper Deck & Co.
 - d. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - e. Koala Kare Products; Bobrick Washroom Equipment, Inc.
 - f. Safe-Strap Company, LLC
 - 2. Basis-of-Design Product: Koala Kare KB300
 - 3. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
 - a. Engineered to support minimum of 200 lb static load when opened.
 - 4. Mounting: Surface mounted, with unit projecting not more than 4 inches (102 mm) from wall when closed.
 - 5. Operation: By pneumatic shock-absorbing mechanism.
 - 6. Material and Finish: HDPE in manufacturer's full range of colors, as selected by Architect.
 - 7. Liner Dispenser: Provide built-in dispenser with tumbler lock for disposable sanitary liners.
 - 8. Safety Straps: Provide replaceable, child-protection straps

2.6 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.
- B. Manufacturers:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc
 - c. Bradley Corporation
 - d. Brey-Krause Manufacturing Co.
 - e. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
- C. Custodial Mop and Broom Holder :
 - 1. Basis-of-Design Product: Bobrick B-224
 - 2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
 - 3. Length: 36 inches (914 mm).
 - 4. Hooks: Three.
 - 5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
 - 6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
 - a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.
 - b. Rod: Approximately 1/4-inch- (6-mm-) diameter stainless steel.
 - 7. Location: All Service Sinks.

2.7 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- (0.8-mm-) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.
- C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch- (0.9-mm-) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.8 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET, BATH, AND LAUNDRY ACCESSORIES

- A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.

- B. Related Requirements:

- 1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINETS

- A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
 - 1. Cabinet Metal: Enameled-steel sheet.
 - 2. Shelf: Same metal and finish as cabinet.
- B. Cabinet Type: Suitable for the following:
 - 1. Fire extinguisher.
- C. Cabinet Mounting: Suitable for the following mounting conditions:
 - 1. Semi-recessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

- D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.
- E. Cabinet Trim Material: Manufacturer's standard, as follows:
 - 1. Steel sheet.
- F. Door Material: Manufacturer's standard, as follows:
 - 1. Steel sheet.
- G. Door Glazing: Manufacturer's standard, as follows:
 - 1. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:
 - a. Class 1 (clear).
- H. Door Style: Manufacturer's standard design, as follows:
 - 1. Fully glazed panel with frame.
- I. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
 - 1. Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
- J. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.
- K. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
 - a. Identify bracket-mounted extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.
 - b. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
 - 1) Application Process: Vinyl letters.
 - 2) Lettering Color: White.
 - 3) Orientation: Vertical.
- L. Materials:
 - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: As selected by Architect from full range of industry colors and color densities.
 - 2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Prepare doors and frames to receive locks.
 - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
 1. Fire-Protection Cabinets: 42 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
 2. Provide inside latch and lock for break-glass panels.
 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Apply decals at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."
 - 2. Section 233813 "Commercial-Kitchen Hoods" for fire-extinguishing systems provided as part of commercial-kitchen exhaust hoods.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul; brand of Johnson Controls International plc, Building Solutions North America.
 - c. Babcock-Davis.
 - d. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
 - e. Kidde; Carrier Global Corporation.
 - f. Larsen's Manufacturing Company.

g. Nystrom, Inc.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
 3. Valves: Manufacturer's standard.
 4. Handles and Levers: Manufacturer's standard.
 5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
1. Mounting Height: Top of fire extinguisher to be at 42 inches (1067 mm) above finished floor.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

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. Welded athletic lockers.
 - a. Double Tier
 - 2. Welded, open-front athletic lockers.
 - 3. Locker benches.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 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. The following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Blank identification plates.
 - b. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.
- B. Deliver master and control keys and combination control charts to Owner.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Welded Metal Lockers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 SOURCE LIMITATIONS**

- A. Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: For lockers and locker benches indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.3 WELDED ATHLETIC LOCKERS

- A. Locker Type and Location:
 - 1. Welded Athletic Double-Tier, 18" w x 15" d x 36"/72"h
 - a. Referee Locker Room 1118: Qty 2 each (4 total lockers)
- B. Basis-of-Design Product: AMP Champ Elite Fully-Framed All-Welded Athletic Lockers
 - 1. Other Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Art Metal Products (AMP)
 - b. American Locker
 - c. ASI Storage Solutions
 - d. List Industries
 - e. Lyon LLC
 - f. Penco Products, Inc.
 - g. Republic Storage Systems, LLC
 - h. WEC Manufacturing LLC
- C. Perforated Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges and latch point (bottom) and right-angle single bend at remaining edges for box lockers.
 - 1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
- D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: 0.060-inch (1.52-mm) nominal thickness, with single bend at edges.
 - 2. Backs: 0.048-inch (1.21-mm) nominal thickness.
 - 3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.
- E. Perforated Sides: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations.
- F. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet or 0.097-inch (2.45-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
2. Cross Frames for Triple-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- G. Reinforced Bottoms: Structural channels, formed from 0.075-inch (1.90-mm) nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- H. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 1. Continuous Hinges: Manufacturer's standard, steel; side or top mounted as required by locker configuration.
- I. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- J. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
- K. Locks: Designed for Combination padlocks.
- L. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
- M. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- N. Continuous Zee Base: 4 inches (102 mm) high; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet.
- O. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 1. Closures: Vertical-end type.
- P. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- Q. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.
- R. Materials:
 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- S. Finish: Baked enamel or powder coat.
 1. Color: As selected by Architect from manufacturer's full range.

2.4 WELDED, OPEN-FRONT ATHLETIC LOCKERS

- A. Locker Type and Location:
 1. Athletic Single-Tier, Open front, 24" w x 18" d x 72" h
 - a. Visitor Locker Room 1107: Qty 14
- B. Basis-of-Design Product: AMP Pro Sport Twin-Frame all-welded open-front athletic locker
 1. Other Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Art Metal Products (AMP)
 - b. American Locker
 - c. ASI Storage Solutions
 - d. List Industries
 - e. Lyon LLC
 - f. Penco Products, Inc.
 - g. Republic Storage Systems, LLC
 - h. WEC Manufacturing LLC

- C. Locker Arrangement: Open front, with seat and upper shelf.
- D. Material: Cold-rolled steel sheet.
- E. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops and Bottoms: 0.060-inch (1.52-mm) nominal thickness, with single bend at edges.
 - 2. Backs: 0.048-inch (1.21-mm) nominal thickness.
 - 3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.
- F. Perforated Sides: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations. Perforations not to occur above upper shelf, at security compartment or at seat/footlocker.
- G. Expanded-Metal Sides: Fabricated from 0.090-inch (2.28-mm) nominal-thickness expanded metal; welded to 0.105-inch (2.66-mm) nominal-thickness steel angles or 0.060-inch (1.52-mm) nominal-thickness steel channel frames.
- H. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet or 0.105-inch (2.66-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames.
- I. Reinforced Bottoms: Structural channels, formed from 0.075-inch (1.90-mm) nominal-thickness steel sheet; welded to front and rear of side-panel frames.
- J. Seats/Shelves: Full width of metal locker; channel formed; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet; with stiffeners for reinforcement.
- K. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.
- L. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- M. Coat Rods: 1-inch- (25-mm-) diameter stainless steel tubing, full width
- N. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
- O. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.
- P. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- Q. Continuous Welded Integral Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch (1.52-mm) nominal-thickness steel sheet.
 - 1. Height: 4 inches (102 mm)
- R. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- S. Finish: Baked enamel or powder coat.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.5 LOCKER BENCHES

- A. Location:
 - 1. Visitor Locker Room 1107
 - a. Provide one (1) ADA bench 42" W x 20" D
 - 2. Boys' Locker Room 1110
 - a. Provide one (1) ADA bench 42" W x 20" D
 - 3. Referee Locker Room 1118
 - a. Provide one (1) ADA bench 42" W x 20" D
 - 4. Girls' Locker Room 1122
 - a. Provide one (1) ADA bench 42" W x 20" D
 - 5. Visitor/Volleyball Locker Room 1124
 - a. Provide one (1) ADA bench 42" W x 20" D
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Art Metal Products (AMP)

2. American Locker
 3. ASI Storage Solutions
 4. List Industries
 5. Lyon LLC
 6. Penco Products, Inc.
 7. Republic Storage Systems, LLC
 8. WEC Manufacturing LLC
- C. Provide bench units with overall assembly height of 18 inches.
- D. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick (241 mm wide by 32 mm thick) except provide 20- to 24-inch- (508- to 610-mm-) wide tops where accessible benches are indicated.
 2. Extruded aluminum with clear anodic finish.
- E. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
1. Tubular Steel:
 - a. 1-1/2-inch- (38-mm-) diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
 - b. Color: As selected by Architect from manufacturer's full range.
- F. Materials:
1. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
 2. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
 3. Steel Tube: ASTM A500/A500M, cold rolled.

2.6 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 3. Triple-Tier Units: One double-prong ceiling hook.
 4. Open-Front Athletic Lockers: Two single-prong wall hooks bolted to locker back and coat rod.
- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.
- E. Accessible Lockers: Fabricate as follows:
1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.
- F. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.
- G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
1. Sloping-top corner fillers, mitered.
- H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- I. Boxed End Panels: Fabricated with 1-inch- (25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.7 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers and to floor.
 - 3. Anchor back-to-back metal lockers to floor.
- B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification provided by architect and owner.
 - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
 - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach filler panels with concealed fasteners.
 - 2. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 3. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
- E. Fixed Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches (1830 mm) apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 105300 – ALUMINUM WALKWAY COVERS

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:
 1. Manufactured exterior wall-mounted covers
- B. Related Sections: The following sections contain requirements that relate to this section:
 1. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.
 2. Division 7 Section "Flashing and Sheet Metal" for flashing, gutters, and other sheet metal work.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide a complete, integrated set of metal walkway cover system manufacturer's standard mutually dependent components and assemblies that form a metal walkway cover system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water other than through integral drainage system. Include primary and secondary framing, roof panels, and accessories complying with requirements indicated, including those in this Article.
- B. Metal Walkway Cover System Design: Of size, spacing, slope, and spans indicated, and as follows:
- C. Structural Performance: Provide metal walkway cover systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Engineer walkway cover systems to comply with load requirements of current Building Code adopted by local and state Authorities having Jurisdiction.
 2. Roof Snow Loads: Include vertical loads induced by the weight of snow, as determined by 50-year mean-recurrence-interval ground snow load at Project site. Allow for unbalanced and drift loads.
 3. Wind Loads: Include horizontal loads induced by a basic wind speed corresponding to a 10-year mean-recurrence interval at Project site.
 4. Collateral Loads: Include additional dead loads other than the weight of metal walkway cover system for permanent items such as electrical systems.
 5. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:
 - a. Beams: Vertical deflection of 1/180 of the span.
 - b. Roof Panels: Vertical deflection of 1/180 of the span.
 6. Design secondary framing system to accommodate deflection of primary building structure and construction tolerances.
- D. Thermal Movements: Provide metal walkway cover systems 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 joint sealants, 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.
- E. Wind-Uplift Resistance: Provide roof panel assemblies that meet the local requirements of wind zone II. UL 580 for the following wind-uplift resistance:
 1. Class 105.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following metal building system components:
 1. Structural-framing system.
 2. Roof panels.
 3. Trim and closures.
 4. Accessories.
- B. Shop Drawings: For the following metal walkway cover system components. Include plans, elevations, sections, details, and attachments to other Work.

1. For installed components indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 3. Roof Layout Drawings: Show layouts of panels on support framing, details of edge conditions, joints, panel profiles, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of the following products with factory-applied color finishes:
1. Roof panels.
 2. Structural-framing system.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected, in the profile and style indicated. Prepare Samples from the same material to be used for the Work.
1. Roof Panels: 12 inches (300 mm) long by actual panel width. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.
 2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
- E. Product Certificates: Signed by manufacturers of metal walkway cover systems certifying that products furnished comply with requirements.
1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 - a. Name and location of Project.
 - b. Order number.
 - c. Name of manufacturer.
 - d. Name of Contractor.
 - e. Structure dimensions, including width, length, height, and roof slope.
 - f. Governing building code and year of edition.
 - g. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure.
 - h. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
- F. Erector Certificates: Signed by manufacturer certifying that erectors comply with requirements.
- G. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.
- H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal building systems that are similar to those indicated for this Project in material, design, and extent.
- B. Manufacturer Qualifications: A firm experienced in manufacturing metal walkway cover systems similar to those indicated for this Project and with a record of successful in-service performance.
1. Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.
- C. Source Limitations: Obtain each type of metal walkway cover system component through one source from a single manufacturer.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to metal building systems including, but not limited to, the following:
1. Inspect and discuss condition of foundations and other preparatory work performed by other trades.
 2. Review structural load limitations.

3. Review and finalize construction schedule and verify availability of materials, Erector's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review weather and forecasted weather conditions and procedures for unfavorable conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package roof panels for protection during transportation and handling.
- B. Handling: Unload, store, and erect roof panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit roof panel installation to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify metal walkway cover system foundations by field measurements before metal walkway cover fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

- A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.9 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty on Panels: Written warranty, executed by manufacturer agreeing to repair or replace roof and wall panels that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Three years from date of Substantial Completion.
- C. Special Warranty on Panel Finishes: Written warranty, signed by manufacturer agreeing to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.
 1. Warranty Period for Roof Panels: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturer: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 1. Peachtree Protective covers, Kennesaw, Georgia
 2. Tennessee Valley Metals, Oneonta, Alabama
 3. Alcan Building Products, Charlotte, North Carolina
 4. Superior Aluminum Products, Birmingham, Alabama

2.2 SYSTEM DESCRIPTION – WALL-MOUNTED COVERS:

- A. General: Covers shall drain away from main building structure.
- B. Components: Provide components of general description listed below to suit size, shape, and layout of metal walkway cover system indicated on drawings.
 1. Roof panel:
 - a. Extruded self-flashing sections interlocking into a composite unit with welded plate closures at ends.
 - 1) Thickness: 0.032 inches minimum.
 2. Extruded Fascia/Gutter, full perimeter, size as required by engineer, but no smaller than the following minimum size:
 - a. 12 inches ht.
- C. Anchor to provided gusseted block-outs anchored to CMU wall or building structure. Reactions, attachment, etc. to be provided by Awning Vendor.

- D. Design in accordance with: **The Aluminum Design Manual 2000**
- E. Provide all welded extruded aluminum system complete with internal drainage.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
 - 1. Use aluminum or stainless-steel fasteners.
 - 2. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
 - 3. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
 - 4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
- B. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
 - 1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - 2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
 - 3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.

2.4 FABRICATION, GENERAL

- A. General: Provide all welded extruded aluminum system complete with internal drainage.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Finish for Extruded Aluminum components:
 - 1. Acrylic-Enamel Coating: Consisting of epoxy primer and baked-on acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 - a. Color: As selected by Architect from manufacturer's full range of colors.
- E. Finish for Roll Formed Aluminum components:
 - 1. Acrylic-Enamel Coating: Consisting of epoxy primer and baked-on acrylic-enamel topcoat, with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 - a. Color: As selected by Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 LAYOUT

- A. General: Comply with dimensioned layout of metal walkway cover system.
- B. Coordinate layout with concrete walk joint layout if indicated to coincide with walkway cover column locations.

3.2 ERECTION

- A. Erect metal walkway cover system straight, true, and plumb according to manufacturer's written instructions and erection drawings. Walkway covers with projections less than 10 feet shall have a minimum slope of 1/8 inch per foot. Walkway covers with projections greater than 10 feet shall have a minimum slope of 1/4 inch per foot.
- B. Provide Cross Beam, parallel to roof panel corrugation between aligned posts, at every set of posts, for the purpose of mounting light fixtures. Do not allow water drainage to pass through the cross beam.

- C. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- D. Set structural framing in locations and to elevations indicated and according to specifications referenced in this Section. Maintain structural stability of frame during erection.
- E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.

3.3 ROOF PANEL INSTALLATION

- A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Fasten roof panels to structure with exposed fasteners at each lapped joint at location and spacing determined by manufacturer.
 - 2. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 3. 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.
 - 4. Arrange and nest side-lap 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.
 - 5. Locate and space exposed fasteners in true vertical and horizontal alignment.
- B. Provide flashing into adjacent brick wall abutted by cover system.
- C. Watertightness: Fit roofing panels to drainage beams and other components to channel water through drainage system. Replace components allowing water leakage.

3.4 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction. Touch up abrasions, marks, skips, or other defects to surfaces.

END OF SECTION

SECTION 105613 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Four-post metal storage shelving.
 - 2. Provide shelving as specified in Room 1103 Concession Storage.

1.3 COORDINATION

- A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.
- B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
- B. Shop Drawings: For metal storage shelving.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include installation details of connectors, lateral bracing, and special bracing.
- C. Samples: For each type of metal storage shelving and for each color specified, in the following sizes:
 - 1. Vertical Supports: 12 inches (305 mm) tall.
 - 2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep (610 mm wide by 305 mm deep).
 - 3. Connectors: Full size.
 - 4. Shelf-Label Holders: Full size.
- D. Samples for Initial Selection: For each type of metal storage shelving with factory-applied color finishes.
 - 1. Include Samples of accessories involving color selection.
- E. Samples for Verification: For the following components, of size indicated below:
 - 1. Vertical Supports: 12 inches (305 mm) tall.
 - 2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep (610 mm wide by 305 mm deep).
 - 3. Connectors: Full size.
 - 4. Shelf-Label Holders: Full size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For metal storage shelving, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of metal storage shelving.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 FOUR-POST METAL STORAGE SHELVING

- A. Open Four-Post Metal Storage Shelving: Complying with MH 28.1 and field assembled from factory-formed components. Shelves span between supporting corner posts that allow shelf-height adjustment over full height of shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Lyon Bulk Storage Rack
 - b. Montel Aetnastak Inc.
 - c. Penco Products, Inc.
 - d. Republic Storage Systems, LLC.
 2. Load-Carrying Capacity per Shelf: 700 lb (318 kg).
 3. Posts: Fabricated from hot-rolled steel; in angle shape; with perforations at 1-1/2 inches (38 mm) o.c. to receive shelf-to-post connectors.
 - a. Unit Configuration: Configure shelving units as individual, freestanding assemblies.
 - b. Post Base: Adjustable steel floor plate, drilled for floor anchors.
 4. Bracing: Manufacturer's standard, single or double diagonal cross bracing.
 - a. Location: At unit back and ends as required for stability, load-carrying capacity of shelves, and number of shelves indicated.
 5. Solid-Type Shelves:
 - a. Metallic-Coated Steel Sheet: Nominal thickness as required for load-carrying capacity per shelf.
 - b. Slots or Holes for Shelf Dividers: 2 inches (51 mm) o.c.
 - c. Fabricate fronts and backs of shelves with vertical edges that are flanged and returned, with edges reinforced with steel angles or channels.
 6. Shelf Quantity: Three shelves per shelving unit in addition to top and bottom shelf.
 7. Shelf-to-Post Connectors: Manufacturer's standard connectors.
 8. Base: Open, with exposed post legs.
 9. Overall Unit Width: 72 inches, inclusive of two end posts.
 10. Overall Unit Depth: 24 inches (610 mm).
 11. Overall Unit Height: 72 inches (1829 mm).
 12. Steel Finish: Baked enamel.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.2 FABRICATION

- A. Fabricate metal storage shelving components to provide field-assembled units that are square and rigid, with posts plumb and true and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.
1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 2. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
 3. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.
- B. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- C. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch (0.8 mm). Shear and punch metals cleanly and accurately. Remove burrs.
- D. Weld corners and seams continuously to develop strength, minimize distortion, and maintain the corrosion resistance of base metals. At exposed locations, finish welds and surfaces smooth and blended so surface is smooth after finishing and contour of welded surface matches that of adjacent surface. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces before finishing.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where metal storage shelving will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Vacuum and clean finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

- A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of dents or distortion. Make connections to form a rigid structure, free of buckling and warping.
 - 1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 2. Install braces, straps, plates, brackets, and other reinforcements as needed to support shelf loading and as required for stability.
 - 3. Adjust post-base bolt leveler to achieve level and plumb installation.
 - 4. Install shelves in each shelving unit at spacing indicated on Drawings.
 - a. Four-Post Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.
- B. Accessories:

3.4 ERECTION TOLERANCES

- A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch (13 mm) in up to 10 feet (3 m) of height, not exceeding 1 inch (25 mm) for heights taller than 10 feet (3 m).
- B. Erect post-and-beam metal storage shelving to a maximum tolerance from vertical of 1/4 inch (6 mm) in 84 inches (2134 mm) of height.

3.5 ADJUSTING

- A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.
- B. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.
- C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
- D. Replace metal storage shelving components that have been damaged beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105613

SECTION 112300 – COMMERCIAL LAUNDRY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Washer Extractors.
 - 2. Drying Tumblers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Product Schedule: For appliances.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Product Certificates: For each type of appliance.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.
- B. Basis of design: Unimac

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design.

2.3 LAUNDRY EQUIPMENT

- A. Washer Extractors.
 - 1. Basis-of-Design Product: Unimac UWT065V4
 - 2. Type: Freestanding.
 - 3. Dimensions:
 - a. Width: 34.1 inches.

- b. Depth: 51.1 inches
 - c. Height: 64.4 inches.
 - 4. Sound Level: Maximum 55 dBA.
 - 5. Controls: Touch-pad controls with four wash cycles and hot-air and heat-off drying cycle options.
 - 6. Features:
 - 7. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 - 8. Material: Stainless steel.
 - a. Color/Finish: Stainless Steel.
- B. Drying Tumblers.
- 1. Basis-of-Design Product: Unimac UT075EVN
 - 2. Type: Freestanding.
 - 3. Dimensions:
 - a. Width: 38.5 inches.
 - b. Depth: 53 inches
 - c. Height: 77.3 inches.
 - 4. Sound Level: Maximum 55 dBA.
 - 5. Controls: Touch-pad controls with four wash cycles and hot-air and heat-off drying cycle options.
 - 6. Features:
 - 7. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product-labeling program.
 - 8. Material: Stainless steel.
 - a. Color/Finish: Stainless Steel.

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After installation, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
 - C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113013

SECTION 122113 - HORIZONTAL LOUVER BLINDS

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. Horizontal louver blinds, aluminum slats.
- B. Scope of Installation: Provide blinds in coach offices 1112 and 1121
- C. Related Sections include the following:
 - 1. Division 8 Sections for windows with horizontal louver blinds mounted in window openings.
 - 2. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type and color of horizontal louver blind.
 - 1. Include Samples of accessories involving color selection.
- C. Samples for Verification: Actual sample of finished products for each type and color of horizontal louver blind.
 - 1. Size: Manufacturers' standard size.
- D. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For horizontal louver blinds with polymer slats that have been tested for compliance with NFPA 701, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For horizontal louver blinds.
- B. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining horizontal louver blinds and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance.
 - 3. Operating hardware.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation, using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain horizontal louver blinds from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Window Covering Safety Standard: Provide horizontal louver blinds that comply with WCMA A100.1.
- B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.

2.3 HORIZONTAL LOUVER BLINDS, ALUMINUM LOUVER SLATS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hunter Douglas Contract.
 - 2. Levolor.
 - 3. Springs Window Fashions; SWFcontract.
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radius corners.
 - 1. Width: 1 inch (25 mm).
 - 2. Thickness: Not less than 0.008 inch (0.20 mm).
 - 3. Spacing: Manufacturer's standard.
 - 4. Finish: Ionized antistatic, dust-repellent, baked polyester finish.
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrails fully enclose control mechanisms on three sides.
 - 1. Capacity: One blind per headrail unless otherwise indicated.
 - 2. Ends: Manufacturer's standard.
- D. Manual Cordless Operation:
 - 1. Lift Mechanism: Manufacturer's standard lift- or tension-control mechanism that allows blinds to be raised or lowered into position by manually pushing the bottom rail up or pulling it down.
 - 2. Lift Operator: Manufacturer's standard.
 - 3. Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
 - 4. Tilt Position:
 - a. Full.
 - 5. Tilt Operator: Clear-plastic wand.
 - 6. Tilt Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over-rotation of gear.
 - 7. Tilt-Operator Length: Manufacturer's standard
 - 8. Tilt-Operator Location: Manufacturer's standard
- E. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and inner lift cords and has plastic- or metal-capped ends.
 - 1. Type: Manufacturer's standard.
- F. Integrated Headrail/Valance: Curved face.
- G. Valance: Manufacturer's standard.
- H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: End mounting permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by horizontal louver blind manufacturer for weight and size of blind.
- I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
- J. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.
- K. Colors, Textures, Patterns, and Gloss:

1. Slats: As selected by Architect from manufacturer's full range.
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.4 FABRICATION OF HORIZONTAL LOUVER BLINDS

- A. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
 2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- C. Mounting Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind mounting method indicated.
- D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- E. Color-Coated Finish:
 1. Metal: For components exposed to view, unless anodized or plated finish is indicated, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pre-treatment, application, baking, and minimum dry film thickness.
 2. Wood: Apply manufacturer's standard factory-applied finish complying with manufacturer's written instructions for surface preparation, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF HORIZONTAL LOUVER BLINDS

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
 1. Locate so exterior slat edges are not closer than 1 inch (25 mm) from interior faces of glass and not closer than 1/2 inch (13 mm) from interior faces of glazing frames through full operating ranges of blinds.
 2. Install mounting brackets to prevent deflection of headrails.
 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation in accordance with manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 122113

SECTION 123623 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-clad countertops.
 - 2. Accessories.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Plastic-laminate-clad countertops.
 - 2. Accessories.
- B. Shop Drawings: For plastic-laminate-clad countertops.
 - 1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
 - 2. Show locations and sizes of cutouts and holes for plumbing fixtures faucets soap dispensers electrical switches, electrical outlets and other items items installed in plastic-laminate-clad countertops.
 - 3. Apply AWI Quality Certification Program label to Shop Drawings.
- C. Samples:
 - 1. Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.
 - 2. 3mm PVC Edge Band in each color in manufacturer's standard size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For the following:
 - 1. Composite wood products.
 - 2. High-pressure decorative laminate.
 - 3. Chemical-resistant, high-pressure decorative laminate.
 - 4. Adhesives.
- C. Quality Standard Compliance Certificates: AWI Quality Certification Program.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products; AWI's Quality Certification Program accredited participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas.
- B. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- C. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- D. Keep surfaces of countertops covered with protective covering during handling and installation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

- B. Environmental Limitations with Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.
- C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Basis of Design: As indicated on finish schedule.
 - a. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Wilsonart
 - 2) Formica
 - 3) Nevamar
 - 4) Pionite
 - 5) Arborite
- B. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
- C. Grade: Custom.
- D. Regional Materials: Plastic-laminate countertops shall be manufactured within 500 miles (800 km) of Project site.
- E. High-Pressure Decorative Laminate: ISO 4586-3, Grade HGS
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations.
- G. Edge Treatment: As indicated on drawings. If not indicated on drawings provide PVC edge banding, 3.0 mm thick, in matching laminate color, pattern, and finish.
- H. Core Material: Medium-density fiberboard made with exterior glue.
- I. Core Material at Sinks: exterior-grade plywood.
- J. Core Thickness: 3/4 inch (19 mm).
 - 1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.
 - 2. MDF: Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 4. Softwood Plywood: DOC PS 1.

2.3 ACCESSORIES

- A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Outside Diameter: 1-1/4 inch (32 mm)
 - 2. Color: As selected by Architect from manufacturer's full range.

2.4 MISCELLANEOUS MATERIALS

- A. Adhesive for Bonding Plastic Laminate: Type I, waterproof type (at wet locations), Type II water-resistant type as selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of cutouts by saturating with varnish.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches (3-mm-in-2400-mm) variation from a straight, level plane.
 - 2. Secure backsplashes [to tops with concealed metal brackets at 16 inches (400 mm) o.c.] [and] [to walls with adhesive].
 - 3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123553

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid surface material countertops.
 - 2. Solid surface material backsplashes.
 - 3. Solid surface material end splashes.
 - 4. Solid surface material apron fronts.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials and sinks.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- C. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches (150 mm) square.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.
 - 1. Manufacturers:
 - a. Basis of Design: As indicated on finish schedule.
 - b. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) DuPont; DuPont de Nemours, Inc. (Corian)
 - 2) Durasein Solid Surface; a brand of Relang International, LLC.
 - 3) Formica Corporation.
 - 4) LG Hausys, Ltd.
 - 5) Livingstone
 - 6) Wilsonart LLC.

2. Type: Provide Standard type or Veneer type made from material complying with requirements for Standard type, as indicated unless Special Purpose type is indicated.
 3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
 4. Colors and Patterns: As indicated on finish schedule.
- B. Particleboard: ANSI A208.1, Grade M-2.
- C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 **FABRICATION**

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
1. Grade: Custom.
- B. Configuration:
1. Front: Straight, slightly eased at top
 - a. Provide separate apron, recessed 1/4-inch (6.4-mm) behind front edge where indicated in drawings
 2. Backsplash: Straight, slightly eased at corner
 3. End Splash: Matching backsplash.
- C. Countertops:
1. 1/2-inch- (12.7-mm-) thick, solid surface material with front edge built up with same material.
 2. 1/4-inch- (6.4-mm-) thick, solid surface material laminated to 3/4-inch- (19-mm-) thick particleboard with exposed edges built up with 3/4-inch- (19-mm-) thick, solid surface material
- D. Backsplashes: 1/2-inch- (12.7-mm-) thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Fabricate with loose backsplashes for field assembly.
 2. Install integral sink bowls in countertops in the shop.
- F. Joints:
1. Fabricate countertops without joints.
 2. Fabricate countertops in sections for joining in field, with joints at locations indicated.
 - a. Joint Locations: Not within 18 inches (450 mm) of a sink or cooktop and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.
 - b. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints where indicated. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.
- G. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
 - c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.
 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
 4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 **INSTALLATION MATERIALS**

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 126600 - TELESCOPING STANDS

PART 1 - PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Manufacture, deliver and install Telescopic Seating Systems in accordance with applicable codes, the following specifications, and approved drawings.

1.2 RELATED WORK BY OTHERS

- B. Adequate floor levelness and strength for operation of telescopic seating.
- C. Adequate wall strength for attachment and operation of wall attached telescopic seating.
- D. Electrical wiring within the building as required for power operated telescopic seating.

1.3 SYSTEM DESCRIPTION

- A. Telescopic seating system shall be multiple tiered seating rows comprised of seat and deck components, risers, and supportive understructure.
- B. Telescopic seating shall be operable on the telescopic principle, stacking vertically in minimum floor area when not in use.
- C. The first moving row, on manual sections, shall be secured with release lever. All other rows shall be mechanically locked, operable only upon unlocking and cycling of first row. Power sections shall be secured with mechanical locks as well as the power system, operable upon activating the pendant control.

1.4 QUALITY ASSURANCE

- A. DESIGN LOAD CRITERIA (STRUCTURAL):
 1. International Building Code Standard: Comply with requirements of IBC / ICC 300, Chapter 4 "Standard for Bleachers, Folding and Telescopic Seating and Grandstands Assembly Seating," except where other requirements are indicated by the architect/owner.
- B. Partial Loading Requirements: Telescopic seating governed by IBC 2018, ICC-300 2017, NFPA 102 2016 or NFPA 5000 2018 shall all comply with ASCE 2016, Section 4.3.3 Partial Loading.
- C. Manufacturer: Company specializing in telescopic seating with a minimum of 25 years' experience in manufacturing telescopic seating.
- D. Engineer Qualifications: Manufacturer to employ a registered, licensed Professional Engineer to certify that the equipment to be supplied meets or exceeds the design criteria of this specification.
- E. Installation: Shall be handled directly by the manufacturer or by a factory certified installation subcontractor.
- F. Product Liability: Certification of insurance coverage of not less than \$5,000,000.
- G. Welding Processes: To be performed by certified professional welding operators in accordance with American Welding Society – Certified Welding Fabricator, (AWS-CWF), D1,1 "Structural Welding Code-Steel."
- H. Product Improvements: Equipment provided shall incorporate manufacturer's design improvements and materials current at time of shipment, provided that such improvements and materials are consistent with the intent of these specifications.

1.5 SUBMITTALS

- A. BID SUBMITTALS
 1. Manufacturer's descriptive literature and specifications.
 2. List of deviations from these specifications, if any.
 3. Certification of Insurance.
- B. JOB SUBMITTALS
 1. Shop Drawings showing all equipment to be furnished with details of accessories to be supplied including necessary electrical service to be provided by others. All electrical submittals must include U.L. listing number.
 2. Samples of material and color finish as requested by Architect.
 3. Warranty, operation and maintenance instructions to the owner upon completion.

1.6 DESIGN CRITERIA

- A. Telescopic seating shall be designed to support, in addition to its own weight, and the weight of added accessories, a uniformly distributed live load of not less than 100 lbs. per sq. ft. (4.8 kN per sq. m.) of gross horizontal projection. Seat boards and footrest shall be designed for a live load of not less than 120 lbs. per linear foot (1.751 kN per linear m).
- B. Sway force applied to seats shall be 24 lbs. per linear ft. (350 N per linear m.) parallel to the seats and 10 lbs. per linear ft. (146 N per linear m.) perpendicular to the seats. Sway forces shall not be considered simultaneously applied.
- C. Railings, posts and sockets designed to withstand the following forces applied separately.
- D. Handrails shall be designed and constructed for:
 1. A concentrated load of 200 lbs. (890 N) applied at any point and in any direction.
 2. A uniform load of 50 lbs. per ft. (730 N/m) applied in any direction.
 3. The concentrated and uniform loading conditions shall not be required to be applied simultaneously.
- E. Guards shall be designed and constructed for:
 1. A concentrated load of 200 lbs. (890 N/m) applied at any point and in any direction along the top railing member and; a uniform load of 50 lbs. per ft. (730 N/m) applied horizontally at the required guardrail height and simultaneous uniform load of 100 lbs. per ft. (1460 N/m) applied vertically downward at the top of the guardrail. The concentrated and uniform loading conditions shall not be required to be applied simultaneously.
- F. American Institute of Steel Construction (AISC), American Iron and Steel Institute (AISI) and Aluminum Association (AA) design criteria shall be the basis for calculation of member sizes and connections.
- G. Wood members shall be designed in accordance with National Forest Products Association, (NFOPA), and National Design Specification for Wood Construction.

1.7 WARRANTY

- A. The manufacturer shall warrant all work performed under these specifications to be free of defects for a period of one year.
- B. All understructure components shall be warranted for a period of ten years.
- C. Any materials found to be defective within this period will be replaced at no cost to the owner. This warranty shall not include replacements required by Acts of God, war, vandalism, flood, fire, calamity or deliberate abuse or misuse of the equipment.

PART 2 - PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All seating shall be VersaTract Telescopic Seating System as manufactured by Irwin Seating Company - Telescopic Division, Altamont, IL 62411 or equal, subject to prior approval and strict compliance with these specifications.
 1. Substitution Limitations:
 2. Where approved manufacturers and specific products are listed, submit data on such manufacturer's product which is equal to or better than in quality to the Basis of Design product for approval by Architect. Comply with requirements listed in individual specifications.
 3. Additional manufacturers may submit substitution requests in accordance with procurement substitution and/or substitution procedures, and provide comparable products with the following support information detailed below.
 - a. Written documentation stating specification compliance regarding construction, materials, and standard of quality and manufacturing techniques.
 - b. Note all deviations to the drawings and/or specifications in writing.
 - c. Provide the Architect with full scale seat sample not less than 20 days prior to the bid date. The sample shall represent the exact seat proposed and shall meet the standards set forth in the specification.
 - d. The Owner, or its designated representative, reserves the right to reject any proposal that in their opinion fails to meet the criteria established by this specification. Such decision shall be final.

2.2 MATERIALS

- A. Seating Area: 1 Groups 90 Feet 4 Inches Long Including End Rails, 6 Rows High
Wall Attached, Electrically Operated.
- B. Dimensions:
1. Overall height: 5 Feet 0 Inches
 2. Open depth: 15 Feet 3 5/8 Inches
 3. Closed depth: 4 Feet 11 5/8 Inches
 4. Row Spacing: 31 Inches
 5. Rise per row: 10 Inches
- C. Seating Area: 1 Groups 90 Feet 1 Inches Long Including End Rails, 7 Rows High
Wall Attached, Electrically Operated.
- D. Dimensions:
1. Overall height: 5 Feet 10 Inches
 2. Open depth: 14 Feet 5 1/8 Inches
 3. Closed depth: 5 Feet 9 1/8 Inches
 4. Row Spacing: 26 Inches
 5. Rise per row: 10 Inches

2.3 FABRICATION

- A. Understructure System:
1. Steel supports and rolling frames shall be constructed from formed steel of the size and shape necessary to support the design loads. All support bracing shall begin at Row 2 and be of diagonal or "knee" type for rigidity. Diagonal bracing to be minimum 1 1/2" x 1 1/2" 14-gauge square tubing. Bracing fabricated from open-sided channel, angle iron or flat strap "X" type bracing is unacceptable.
 2. Wheels shall not be less than 5" diameter x 1 3/8" non-marring soft rubber face to protect wood or synthetic floor surfaces. Each operating row shall have a minimum of 6 wheels.
 3. Each fully skirted wheel channel shall be formed 12-gauge steel and continuously in contact with adjacent channels by means of an Integral Alignment System (IAS) and include nylon glides to eliminate any metal to metal contact. The IAS maintains proper alignment between adjacent wheel channels for smooth and consistent operation while eliminating the potential for accidental row separation. Wheel channel alignment systems with metal to metal contact requiring periodic lubrication or that utilizes a guide rod system that can be bent or damaged will not be acceptable.
 4. Each cantilever arm shall be triple-formed 10-gauge steel, securely welded to the post assembly and include a nylon cantilever pad to ensure smooth operation. The cantilever pad shall also provide a firm base when in the occupied position and provide a solid feel when walked on.
 5. Vertical columns shall be high tensile steel structural tube to meet design criteria. Minimum column size to be 2" x 3" 14-gauge structural tube, welded to a 2' wide wheel channel using 360 degrees of weldment.
 6. Deck support members shall be double formed 14-gauge steel and connect the front nosing and rear riser members. Each deck support shall include a unique dual-purpose roller that provides smooth support during operation. The deck support roller shall also include a 3/4" wide shoulder that's encapsulated by the deck support on the row above in order to maintain proper upper alignment while delivering consistent, repeatable operation.
- B. Seat Systems:
1. Infinity Seat: Supply plastic modular 18" individual seats in either 10" or 12" deep models. Seating to be scuff resistant injection molded high density polyethylene plastic. 10" Infinity Seat to be supplied
 - a. Seat modules supplied shall be of a high aesthetic design using multiple textures, style lines and a waterfall front. The rear of the seat shall be slightly curved to eliminate the straight line appearance and include a moderate seat contour and texture to enhance spectator comfort.
 - b. Seating design shall be molded to achieve a finished end appearance without the use of end caps. The rear of the seat shall include a smooth wall allowing for the deck to be easily swept clean without obstruction.
 - c. Seat heights shall be maintained at a minimum of 16 3/4". Lower seat heights which detour from spectator comfort will not be accepted.
 - c. Foot space shall be maximized for spectator comfort and provide a minimum of 22" when measured with a 10" module and 21" with a 12" module.

- d. Each seat to be designed with the capability of using seat numbers and row letters at the aisle locations. Seat numbers to be stylishly designed using a radius corner to enhance the aesthetic value of the seat. Seat numbers and row letters shall be recessed into the seat to protect against any vandalism.
 - e. Select seating colors from manufacturer's 15 standard colors. Custom colors available as an option.
 - f. Securely fasten each seat to the nose beam using a 10-gauge formed steel bracket and locking hardware. Adjacent seating shall be interlocked together along the full perimeter eliminating any fore or aft movement or the potential of any pinching hazard.
 - g. Seat modules shall be designed to support a uniform load of 600 lbs per seat and a concentrated load of 150 lbs over 4 square inches.
2. **Integra Chair:** Supply fold-down chairs on telescoping platforms with seats, backs, and a full complement of standards, fold-down mechanism and all support structure required for a fully functional seating system.
- a. Platform chairs shall have a modern look with complementary style lines, comfortable contours and subtle texture to achieve maximum spectator comfort.
 - b. Each chair to be constructed from durable, scuff resistant injection molded high density polypropylene plastic, designed to support over 700 pounds per chair.
 - c. Seat heights shall be maintained at a minimum of 17 ½ inches. Lower seat heights which detour from spectator comfort will not be accepted.
 - d. Actual seat width shall not be less than 17 ¼ inches.
 - e. Back heights to be a minimum of 31 ½" and designed to fold within the depth of the deck when in the stored position. Chairs extending beyond the face of the unit when closed will not be acceptable.
 - f. Chairs shall be rail mounted and allow for complete flexibility in chair layout. Seat spacing to be available from 18" to 24", and field adjustable.
 - g. Each chair shall have the capability of using seat numbers and row letters at the aisle locations. Seat numbers and row letters to have a stylish round design to enhance the aesthetic value of the seat, and be recessed to protect against vandalism.
 - h. Select seating colors from manufacturer's 15 standard colors. Custom colors available as an option.
 - i. Securely fasten each chair and arm assembly to a heavy-duty, clear anodized aluminum rail using locking hardware.
3. **Chair Fold-Down System:**
- a. Semi-Automatic Operation with Foot Release: The raising and lowering of up to 12 chairs per operation shall be accomplished with an internal spring assist system. Locking of chairs in the use position shall be totally independent of platform operation. Lowering of each row of chairs shall be done by simply depressing a foot release lever allowing the chairs to fold flat on the deck surface.
4. **Chair Type:**
- a. Plastic Seats and Backs: Seats and backs shall be of high impact resistant injection molded polypropylene plastic, with a textured surface. The face of the seat and back shall be compound-contour molded to promote comfort, uninterrupted by surface grooves with no exposed hardware. For proper comfort, seats and backs shall be a minimum of 17 ¼" wide. Narrower seats which sacrifice spectator comfort will not be acceptable.
5. **Armrest Type:**
- a. Armrest: Armrests shall be injection molded plastic and shall be securely attached to the support structure by concealed fastener, capable of rotating to a vertical position for storage. Armrest rotation mechanism shall be completely shrouded to prevent any pinching or snagging hazard. Armrest support shall be designed to allow for adjustments in chair width to facilitate row alignment. Armrests to be supplied in a satin black finish.
6. **Dust/Debris Covers:**
- a. Dust/debris covers shall be supplied to prevent debris from interfering with the latching mechanism and to simplify cleaning. Dust/debris covers to be located between the 2 primary fold-down mechanisms on manual chair operation, and the entire chair length with semi-automatic operation. Systems that do not include dust/debris covers will not be accepted.
- C. **Deck System:**
1. Panelam decking shall have a 0.030 (30 thousandths) high density polyethylene overlay, permanently bonded over a structural deck panel meeting all flooring load requirements. Deck panels shall be supported along the front and back edge for maximum rigidity and connected using a tongue and groove splice leaving the deck clean and free of any tripping or cleaning obstructions. Decking shall be secured in place by the encapsulation of the rear riser and mechanical fasteners along the front edge. Panelam to be selected from manufacturer's standard colors. Finish thickness to be 5/8".

- D. Nosing:
 - 1. Nosing shall be one piece, formed, 14-gauge steel with a minimum G-60 pre-galvanized finish. Recommended with Infinity seat modules
 - 2. Nosing shall be one piece, formed, 14-gauge steel with a black powder coated epoxy finish. Recommended with Integra chairs
- E. Rear Risers:
 - 1. Rear riser shall be one piece, formed, 14-gauge steel with a minimum G-60 pre-galvanized finish. Recommended with Infinity seat modules
 - 2. Rear riser shall be one piece, formed, 14-gauge steel with a black powder coated epoxy finish. Recommended with Integra chairs
- F. Finish: For rust resistance in standard conditions all painted surfaces shall be finished in textured Epoxy Powder Coated Semi-Gloss Black.

PART 3 - PART 3 - EXECUTION

3.1 ACCESSORIES (Select as applicable)

- A. Aisles shall be footrest level 52 inches wide to provide 4 aisles. Aisles at the footrest level shall include non-slip treads on the top front edge.
- B. Intermediate aisle steps shall be provided. Steps are permanently attached closed design. Steps shall be constructed from 14 ga. steel, finished in a Black powder coated epoxy, and designed to eliminate any possible toe catch between the top of the intermediate step and the bottom of the nose beam per ADA or other applicable codes. Front step shall be removable and interlock to the front row eliminating any possibility of accidental disengagement, and store on the front row when not in use.
- C. Aisle handrails.
 - 1. Smart Rail aisle handrails shall be provided for 22" to 26" row spacing. Aisle railings shall quickly and easily rotate 90 degrees to the locked position and store parallel to the front of the aisle. Railings that require removal from the pocket or the use of tools for storage will not be acceptable. Aisle railings shall be an individual rail design, located on every other row starting at row two (2). Railing to be constructed of 1 1/2" 11 ga. round steel tubing, finished in a textured powder coated epoxy. For safety, railings designed without a full return of the handrail will not be acceptable.
 - 2. Wheel Chair Seating Areas.
 - 3. Recoverable wheel chair spaces shall be provided at the section joint location or section length as shown on plans. An integral support on row two shall be provided to eliminate structural damage to the understructure during the operation and use of the system. Recoverable seating areas do not require front railings for support.
- D. End rails.
 - 1. End rails of the self-storing type, finished with textured epoxy powder-coated black enamel, shall be provided at the open ends of the group. End rails shall start at row three and be constructed from 1" square tubing to meet all national building codes. Railings with flexible uprights that can be expanded beyond the 4" sphere are not acceptable.
- E. Vinyl end curtains shall be provided to limit unauthorized access to the underside of the telescopic system. Curtain to be one piece design shaped to follow the angle of the telescopic unit in the open position and constructed of a sturdy vinyl material with sewn-in grommets for attachment. Color to be selected from manufacturer's standard selection.
- F. Scorer's table shall be 8' long x 18" wide and feature a speckled grey blow molded top. Table to include cantilevered folding legs designed to fit within the seating row without the need for mounting sockets, or for use on the floor in front of the stand.
- G. Video Platform. Supply 4'x8' video platform permanent or semi-permanently attached to the telescopic stand. The video platforms shall be modular in design and constructed of 4'x4' sections, each with a locking system allowing adjacent sections to be securely connected, including all necessary support braces. Deck material to be a minimum of 3/4" plywood core to provide maximum support in a concentrated area and to minimize vibration. Decking surface to be finished in a Black polyethylene finish.
 - 1. Guardrails along the front side of each video platform section shall not be less than 47" wide and 36" high. Guardrails at the ends of the video platform shall not be less than 23" wide and 36" high. All railings to be constructed from steel tubing with a black powder coated finish. The design of each guardrail must comply with IBC/ICC codes.

- H. Seat numbers and row letters shall be supplied in a contrasting, but complementary color for easy seat identification. Layout of numbering to be coordinated with the architect/owner.
- I. Transport systems for portable units. (Select 1 or 2)

3.2 PROPULSION SYSTEM

- A. FRICTION POWER: Integra Drive System (IDS) shall be furnished on each seating group to open and close the telescopic units. Each individual section shall include 2 IDS friction drive systems integrated into the first moving row of understructure to achieve smooth and efficient operation. Operation of the seating shall be accomplished with the use of a walk along pendant control.
 - 1. Each IDS power system shall include large 6 1/2" diameter friction rollers to develop tractive force adequate to open and close the system. Each roller to include non-marring 1/2" thick rubber covering.
 - 2. Electrical motors for each section shall be heavy-duty and high efficiency gear reduction motors. The shaft diameter for the gear motor and rollers shall be a minimum of 1" and be connected by a 1" schedule 40 drive shaft.
 - 3. All roller chain and sprockets used throughout the drive system shall be a minimum of #40 in size. Each drive unit shall be designed to include a safety shroud around the chain and sprocket for overall safety.
 - 4. The power units shall develop tractive forces adequate to operate the seating units under normal conditions but inadequate to operate should significant obstacles be encountered.
- B. Manufacturer shall provide all wiring from power source within bleacher seating including pendant control. Removable pendant control shall be handheld with forward and reverse button, plugging into a single receptacle. Electrical contractor shall provide a 60 HZ power source (as specified below) behind each group of seating. Amperage to be as specified by seating manufacturer depending on the number of power units required. For wall-attached installations, power source to terminate in a surface mounted junction box above floor. For reverse units, power source to terminate in a junction box, flush mounted under first seating row in center of group. Electrical contractor shall perform the connections to the seating equipment at the junction box. All electrical parts and wiring shall be installed in complete accord with the National Electric Code. U.L. Listing FHJU.E479554.
 - Select: Supply power system with 208/230V, 5 wire 3-phase system.
 - Select: Supply power system with 120V single phase system.

3.3 REVIEWS AND APPROVALS

- A. Shop drawings shall be approved and job site field measurements taken prior to installation and telescopic gym seating shall be installed in conformance therewith.

3.4 INSTALLATION

- A. The installation of the telescopic gym seating will be handled directly by the manufacturer or by a factory authorized installation subcontractor qualified to perform the installation function.

3.5 PROTECTION

- A. The manufacturer's representative shall transmit instructions in both operation and maintenance to the owner.
- B. Maintenance and operation of the telescopic gym seating shall be the responsibility of the owner or his duly authorized representative, and shall include the following:
 - 1. During operation of the telescopic gym seating, the opening and closing shall be supervised by responsible personnel who will assure that the operation is in accordance with the manufacturer's instructions.
 - 2. Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the telescopic gym seating.
 - 3. An annual inspection and required maintenance of all telescopic gym seating shall be performed to assure safe conditions. At least bi-annually, the inspection shall be performed by a Professional Engineer or factory service personnel.
- C. Irwin Telescopic Seating Company constantly strives to improve its product and manufacturing methods; therefore, it reserves the right to make changes without notice which, in the opinion of Irwin Seating Company, shall improve the product.

SECTION 133419 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural-steel framing.
 - 2. Metal roof panels.
 - 3. Metal soffit panels.
 - 4. Metal Liner Panels: interior, perforated
 - 5. Thermal insulation.
 - 6. Accessories.
 - a. Roof Drainage System
- B. Related Requirements:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete foundations, slabs, and anchor-bolt installation.
 - 2. Division 4 Section "Unit Masonry Assemblies" for exterior and load-bearing walls fabricated from concrete masonry units.
 - 3. Division 5 Section "Cold-formed Metal Framing"
 - 4. Division 7 Section "Formed Metal Wall Panels"
 - 5. Division 7 Section "Joint Sealants"
 - 6. Division 8 Section "Hollow Metal Doors & Frames"

1.3 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
 - 2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.

- e. Roof observation and repair after metal roof panel installation.
3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Metal roof panels.
 - b. Thermal insulation and vapor-retarder facings.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 3. Metal Roof Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
 4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):
 - a. Flashing and trim.
 - b. Gutters.
 - c. Downspouts.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For the following products:
 1. Panels: Nominal 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 2. Flashing and Trim: Nominal 12 inches (300 mm) long. Include fasteners and other exposed accessories.
 3. Vapor-Retarder Facings: Nominal 6-inch- (150-mm-) square Samples.
 4. Accessories: Nominal 12-inch- (300-mm-) long Samples for each type of accessory.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For erector manufacturer.
- B. Welding certificates.
- C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 1. Name and location of Project.
 2. Order number.
 3. Name of manufacturer.
 4. Name of Contractor.
 5. Building dimensions including width, length, height, and roof slope.
 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 7. Governing building code and year of edition.

8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- D. Erector Certificates: For qualified erector, from manufacturer.
- E. Material Test Reports: For each of the following products:
1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 4. Shop primers.
 5. Nonshrink grout.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.
- I. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect foam-plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.11 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

- A. Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

1. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - a. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - 1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - 2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - 3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - b. Finish Warranty Period: 25 years from date of Substantial Completion.
2. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - a. Warranty Period: 20 years from date of Substantial Completion.
3. Special Project Warranty: Roofing Installer's warranty, on Division of Construction Management warranty form "C-9", signed by roofing Installer, covering Work of this Section, in which roofing Installer agrees to repair or replace components of metal roofing system that fail in materials or workmanship within the following warranty period:
 - a. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. American Buildings, a Nucor Company
 2. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
 3. Ceco Building Systems; an NCI company.
 4. Gulf States Manufacturers; Nucor Company.
 5. Varco-Pruden Buildings; a division of BlueScope Buildings North America, Inc.
- B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type:
 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.
- D. Secondary-Frame Type: As indicated on drawings.
- E. Eave Height: As indicated on Drawings.
- F. Bay Spacing: As indicated on Drawings.
- G. Roof Slope: 1 inch per 12 inches (1:12).
- H. Roof System: Manufacturer's standard standing-seam, vertical-rib, metal roof panels.
- I. Exterior Wall System: as detailed on drawings.
- J. Interior Liner Panels: perforated, horizontal with pencil rib striations.
- K. Prefabricated Metal Awning Support
 1. Provide gusset plates flush with exterior finish material for anchorage of prefabricated awning.
 2. Locations as indicated on drawings.

2.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 1. Design Loads: As indicated on Drawings.

2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
3. Deflection and Drift Limits: as indicated on drawings
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Structural Performance for Metal Roof Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592 or FM 4474.
 1. Wind Loads: As indicated on Drawings.
- E. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- F. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with required wind-uplift-resistance.
 1. Uplift Rating: As indicated on drawings.
- H. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 1. Hail Resistance: MH.
- I. Energy Performance: Provide roof panels according to the following when tested according to CRRC-1:
 1. Initial solar reflectance of 77 and emissivity of not less than 0.08.
 2. Solar Reflectance Index of 72 and emissivity of not less than 0.08.

2.4 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
 3. Frame Configuration: as indicated on drawings.
 4. Exterior Column: as indicated on drawings.
 5. Rafter: as indicated on drawings.
- E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
 1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
 2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
 1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- (64-mm-) wide flanges.
 - a. Depth: As indicated on Drawings.
 2. Purlins: Steel joists of depths indicated on Drawings.

3. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- (64-mm-) wide flanges.
 - a. Depth: As indicated on Drawings.
 4. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 5. Flange Bracing: Minimum 2-by-2-by-1/8-inch (51-by-51-by-3-mm) structural-steel angles or 1-inch- (25-mm-) diameter, cold-formed structural tubing to stiffen primary-frame flanges.
 6. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.
 7. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch (76-by-51-mm), fabricated from zinc-coated (galvanized) steel sheet.
 8. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
 10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- G. Bracing: Provide adjustable wind bracing using any method as follows:
1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 (345); or ASTM A 529/A 529M, Grade 50 (345); minimum 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.
 2. Cable: ASTM A 475, minimum 1/4-inch- (6-mm-) diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
 3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 5. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.
- H. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- I. Materials:
1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
 3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
 4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
 6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or HSLAS, Grades 45 through 70 (310 through 480).
 7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
 8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, SS, Grade 50 or 80 (340 or 550); with Class AZ50 (AZM150) coating.
 9. Joist Girders: Manufactured according to "Standard Specifications for Joist Girders," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for primary framing.

10. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for secondary framing.
11. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
12. Structural Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
13. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.
14. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.
 - a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.
15. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
16. Headed Anchor Rods: ASTM F 1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
17. Threaded Rods: ASTM A 193/A 193M.
 - a. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - b. Washers: ASTM F 436 (ASTM F 436M) hardened carbon steel.
 - c. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
- J. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
 1. Clean and prepare in accordance with SSPC-SP2.
 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil (0.025 mm).
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.

2.5 METAL ROOF PANELS

- A. Standing-Seam, Double Lok, Metal Roof Panels: Formed panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 24-gauge nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Finish: Galvalume.
 2. Clips: One-piece fixed to accommodate thermal movement.
 3. Joint Type: Mechanically seamed.
 4. Panel Coverage: 24 inches.
 5. Panel Height: 2 inches (51 mm).
 6. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.6 METAL WALL PANELS

- A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced flat pan between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: Siliconized polyester.
 - b. Color: As selected by Architect from manufacturer's full range.
 2. Major-Rib Spacing: 12 inches (305 mm) o.c.
 3. Panel Coverage: 36 inches (914 mm).
 4. Panel Height: 1.25 inches (32 mm).
- B. Perforated Metal Liner Panels: Perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with pencil rib striations; designed for interior side of metal wall panel assemblies and installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.
1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Interior Finish: Siliconized Polyester
 - b. Color: As selected by Architect from manufacturer's full range.
 - c. Perforated, acoustic design
 2. Retain "Sound Absorption" Subparagraph below if required.
 3. Sound Absorption: Provide SAB/Sound Attenuating Batts for NRC not less than 0.65 when tested according to ASTM C423.
 4. Panel Coverage: 12 inches (305 mm).
 5. Panel Height: 1.5 inches (38 mm).
 6. Finishes:
 - a. Exposed Coil-Coated Finish:
 - 1) Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat
 - b. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.7 THERMAL INSULATION FOR FIELD-ASSEMBLED METAL PANELS

- A. Roof Liner Insulation System:
1. Basis-of-Design system: Simple Saver System – New Roof and Insulation System by Thermal Design, Inc., 800-255-0776, www.thermaldesign.com
 - a. Or Equal
 2. Provide system **R30+R11** with thermal blocks.
- B. Wall Liner Insulation System.
1. Wall Liner Insulation System. Wall insulation to be as detailed w/ interior batt insulation min. ~~R-24~~ R-25 and continuous exterior insulation min. R-10. Note that interior perforated acoustic metal liner panels are insulated for NRC rating.

2.8 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch (25-mm) standoff; fabricated from extruded polystyrene.
- C. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
 2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- D. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters.
 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- E. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.

2.9 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.10 SOURCE QUALITY CONTROL

- A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.
1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Steel Joists and Joist Girders: Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
5. Joist Installation: Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
6. Joist Installation: Weld joist seats to supporting steel framework.
7. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing only where indicated.
- J. Framing for 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 structural framing.
- K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

- A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Locate metal panel splices over structural supports with end laps in alignment.
 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.
 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 1. Install ridge and hip caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-drilling or self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 - 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Pre-drill panels for fasteners.
 - 6. Provide metal closures at peaks rake edges rake walls and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
 - 1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 - 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 - 3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
 - 4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
 - 1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
 - 2. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 - 3. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
- C. Roof Liner Insulation: Comply with manufacturer's installation instructions.

3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant

- and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
 - D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Tie downspouts to underground drainage system indicated.
 - E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.8 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- D. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- E. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 133419

SECTION 210500 - COMMON WORK RESULTS FOR FIRE

SUPPRESSION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Above ground piping.
- B. Buried piping.
- C. Pipe, fittings, valves, and connections for sprinkler, standpipe and fire hose, and combination sprinkler and standpipe systems.
- D. Expansion loops.
- E. Pipe hangers and supports.

1.2 REFERENCE STANDARDS

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- B. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2013.
- C. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- D. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- E. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Project Record Documents: Record actual locations of components and tag numbering.
- D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified this section.
 - 1. Minimum three years experience.
 - 2. Approved by manufacturer.
- B. Conform to UL, FM, and Warnock Hersey requirements.
- C. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

- A. Sprinkler Systems: Conform work to NFPA 13.
- B. Standpipe and Hose Systems: Conform to NFPA 14.
- C. Welding Materials and Procedures: Conform to ASME Code.

2.2 BURIED PIPING

- A. Steel Pipe: ASTM A53/A53M Schedule 40 or ASTM A53/A53M Schedule 40, black , with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape.
 - 1. Steel Fittings: ASME B16.9 wrought steel buttwelded; with double layer, half-lapped polyethylene tape.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
 - 3. Joints: Welded in accordance with AWS D1.1.

2.3 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A53 Schedule 40, black.
 - 1. Steel Fittings: ASME B16.25 buttweld ends.
 - 2. Cast Iron Fittings: ASME B16.1 flanges and flanged fittings, ASME B16.4 threaded fittings, ASME B16.1 flanges and flanged fittings, and ASME B16.4 threaded fittings.
 - 3. Malleable Iron Fittings: ASME B16.3 threaded fittings.
 - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.4 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.5 MECHANICAL COUPLINGS

- A. Rigid Mechanical Couplings for Grooved Joints:
 - 1. Dimensions and Testing: Comply with AWWA C606.
 - 2. Minimum Working Pressure: 300 psig.
 - 3. Housing Material: Fabricate of ductile iron conforming to ASTM A536.
 - 4. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
 - 5. Bolts and Nuts: Hot dipped galvanized or zinc electroplated steel
 - 6. Product:

2.6 GATE VALVES

- A. Up to and including 2 inches:
 - 1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.
- B. Over 2 inches:
 - 1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.
- C. Over 4 inches:
 - 1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.7 GLOBE OR ANGLE VALVES

- A. Up to and including 2 inches:
 - 1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.
- B. Over 2 inches:
 - 1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.8 BALL VALVES

- A. Up to and including 2 inches:
 - 1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.
- B. Over 2 inches:
 - 1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

2.9 BUTTERFLY VALVES

- A. Bronze Body:
 - 1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device , and built-in tamper proof switch rated 10 amp at 115 volt AC.
- B. Cast or Ductile Iron Body
 - 1. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device , and internal tamper switch rated 10 amp at 115 volt AC.

2.10 CHECK VALVES

- A. Up to and including 2 inches:
 - 1. Bronze body and swing disc, rubber seat, threaded ends.
- B. Over 2 inches:
 - 1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.
- C. 4 inches and Over:
 - 1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.11 DRAIN VALVES

- A. Ball Valve:
 - 1. Brass with cap and chain, 3/4 inch hose thread.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Install standpipe piping, hangers, and supports in accordance with NFPA 14.
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.

- F. Sleeve pipes passing through partitions, walls, and floors.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 099000.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- M. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- O. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- P. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.

END OF SECTION

SECTION 211300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Dry-pipe sprinkler system.
- C. System design, installation, and certification.

1.2 REFERENCE STANDARDS

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
- B. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

- A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Shop Drawings:
 - 1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 2. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to Architect.
- C. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- D. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 - 2. Sprinkler Wrenches: For each sprinkler type.

1.4 QUALITY ASSURANCE

- A. Maintain one copy of referenced design and installation standard on site.
- B. Conform to UL requirements.
- C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Equipment and Components: Provide products that bear UL label or marking.
- E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 - PRODUCTS

2.1 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Water Supply: Determine volume and pressure from water flow test data.

- C. Provide fire department connections where indicated.
- D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.2 SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
 - 1. Finish: Enamel color white .
- B. Exposed Area Type: Pendant type .
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- D. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Finish: Enamel color white .
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- E. Residential Sprinklers: Semi-recessed upright type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- F. Storage Sprinklers: Pendant type with guard.
 - 1. Response Type: Standard.
 - 2. Coverage Type: Standard.
 - 3. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- G. Guards: Finish to match sprinkler finish.

2.3 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
 - 1. Activate electric alarm.
 - 2. Test and drain valve.
 - 3. Replaceable internal components without removing valve from installed position.
- B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
- C. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.
- D. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- E. Fire Department Connections:
 - 1. Type: Flush mounted wall type with brass finish.
 - 2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.
 - 3. Drain: 3/4 inch automatic drip, outside.
 - 4. Label: "Sprinkler - Fire Department Connection".

2.4 AIR COMPRESSOR

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- D. Place pipe runs to minimize obstruction to other work.
- E. Place piping in concealed spaces above finished ceilings.
- F. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- G. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- H. Flush entire piping system of foreign matter.
- I. Install guards on sprinklers where indicated.
- J. Hydrostatically test entire system.
- K. Require test be witnessed by authority having jurisdiction.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND

EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Tags.
- B. Pipe Markers.

1.2 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.
- B. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.3 PIPE MARKERS

- A. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- B. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- C. Color code as follows:
 - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
 - 2. Flammable Fluids: Yellow with black letters.
 - 3. Compressed Air: Blue with white letters.

2.4 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. Plumbing Valves: Green.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install tags with corrosion resistant chain.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- C. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- D. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Flexible elastomeric cellular insulation.
- B. Piping insulation.
- C. Jackets and accessories.

1.2 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 2 years of experience.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, UL 723, ASTM E84, NFPA 255, UL 723, ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER

- A. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 650 degrees F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
 - 1. Aeroflex USA, Inc: www.aeroflexusa.com/#sle.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: -40 degrees F.
 - 2. Maximum Service Temperature: 220 degrees F.
 - 3. Connection: Waterproof vapor barrier adhesive.

2.4 JACKETS

- A. PVC Plastic.
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

- d. Thickness: 10 mil.
- e. Connections: Brush on welding adhesive.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch laps.
 - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations. Jacket to be PVC.
- C. Concealed Piping: Jacket to be white Kraft paper all service jacket.
- D. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
- F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with aluminum jacket.

3.3 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Branches:
 - a. Glass Fiber Insulation:
Thickness: 1/2 inch.
 - 2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
Pipe Size Range: 1/2 inch thru 1-1/4 inch.

Thickness: 1 inch.

Pipe Size Range: 1-1/2 inch or greater

Thickness: 1-1/2 inch
 - 3. Domestic Hot Water Below Grade:
 - a. Flexible Elastomeric Cellular Insulation:
Thickness: 1 Inch
 - 4. Domestic Cold Water:
 - a. Glass Fiber Insulation:

Pipe Size Range: All sizes.

Thickness: 1/2 inch.

5. Roof Drain Bodies:

a. Glass fiber insulation:

Thickness: 1 inch.

6. Roof Drainage Above Grade:

a. Glass Fiber Insulation:

Thickness: 1 inch.

7. Domestic hot and cold water piping in exterior wall or outside building insulation:

a. Glass Fiber Insulation:

Thickness: 1 inch

SECTION 221005 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Valves.
 - 6. Check.
 - 7. Water pressure reducing valves.
 - 8. Relief valves.
 - 9. Strainers.

1.2 REFERENCE STANDARDS

- A. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).
- B. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.3 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.5 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - 3. Solid Core Only

2.2 SANITARY SEWER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - 3. Solid Core Pipe

2.3 WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

- B. PVC Pipe: AWWA C900.

2.4 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
 2. Joints: AWS A5.8, BCuP copper/silver braze.

2.5 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 2. Joints: ASTM B32, alloy Sn95 solder.
 3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.

2.6 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 4. Vertical Pipe Support: Steel riser clamp.
 5. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
 - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

2.8 GATE VALVES

A. Up To and Including 3 Inches:

1. 1, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

2.9 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union.

2.10 SWING CHECK VALVES

A. Up to 2 Inches:

1. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

2.11 WATER PRESSURE REDUCING VALVES

A. Up to 2 Inches:

1. ASSE 1003, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

B. Over 2 Inches:

1. ASSE 1003, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.12 RELIEF VALVES

A. Pressure Relief:

1. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:

1. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.13 STRAINERS

A. Size 2 inch and Under:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.
- G. Provide access where valves and fittings are not exposed.
- H. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- I. Install valves with stems upright or horizontal, not inverted.
- J. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- K. Sleeve pipes passing through partitions, walls and floors.
- L. Pipe Hangers and Supports:
 - 1. Support horizontal piping as scheduled.
 - 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 3. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 4. Provide copper plated hangers and supports for copper piping.
 - 5. Support cast iron drainage piping at every joint.

3.4 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Provide plug valves in natural gas systems for shut-off service.

3.5 TOLERANCES

- A. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

3.7 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves , and sand strainer.
- C. Provide new gas service . Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.8 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:

- a. Pipe size: 1/2 inches to 1-1/4 inches:
 - Maximum hanger spacing: 6.5 ft.
 - Hanger rod diameter: 3/8 inches.
 - b. Pipe size: 1-1/2 inches to 2 inches:
 - Maximum hanger spacing: 10 ft.
 - Hanger rod diameter: 3/8 inch.
 - c. Pipe size: 2-1/2 inches to 3 inches:
 - Maximum hanger spacing: 10 ft.
 - Hanger rod diameter: 1/2 inch.
 - d. Pipe size: 4 inches to 6 inches:
 - Maximum hanger spacing: 10 ft.
 - Hanger rod diameter: 5/8 inch.
2. Plastic Piping:
- a. All Sizes:
 - Maximum hanger spacing: 4 ft.
 - Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cleanouts.
- B. Backflow preventers.
- C. Water hammer arrestors.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 CLEANOUTS

- A. Cleanouts at Exterior Surfaced Areas:
 - 1. Round cast nickel bronze access frame and non-skid cover.
- B. Cleanouts at Exterior Unsurfaced Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- C. Cleanouts at Interior Finished Floor Areas:
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

2.3 BACKFLOW PREVENTERS

- A. Reduced Pressure Backflow Preventers:
 - 1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.4 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors:
 - 1. Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.

- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets .
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Electric water coolers.
- G. Showers.

1.2 SUBMITTALS

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.5 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 - PRODUCTS (SEE PLANS)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with quarter turn stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.

- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 079005, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

- A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

3.8 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Water Closet:
 - a. Standard: 15 inches to top of bowl rim.
 - b. Accessible: 18 inches to top of seat.
 - 2. Water Closet Flush Valves:
 - a. Standard: 11 inches min. above bowl rim.
 - 3. Urinal:
 - a. Accessible: 17 inches to top of bowl rim.
 - 4. Lavatory:
 - a. Accessible: 34 inches to top of basin rim.
 - 5. Drinking Fountain:
 - a. Accessible low: 34-36 inches to top of spout.
 - b. Accessible high: 38-43 inches to top of spout

SECTION 230010 - COMMON HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 VISIT TO SITE

- A. The Contractor shall examine the site and be thoroughly familiar with all existing conditions before submitting his bid. Failure to do so will in no way relieve the Contractor of responsibility under the Contract.

1.2 DRAWINGS

- A. The Mechanical Drawings are diagrammatic in general and indicate generally the locations of component part of the systems, but are not intended to show all fittings or all details of work.
- B. Make no changes without Architect/Engineer's written permission. In case of dispute or doubt as to intent of drawings or specification, obtain Architect/Engineer's decision before proceeding with work involved. Failure to follow this instruction shall make the Contractor liable for damage to other work and for removing and repairing defective or mislocated work in proper manner.

1.3 WORKMANSHIP

- A. Do all work in a neat and first class manner. If so directed by Architect/Engineer, remove and replace any item or work not done so as to present an orderly, neat, and workmanlike appearance, provided that such item can be correctly installed by usual methods of the trade.

1.4 COORDINATION OF MECHANICAL INSTALLATION

- A. Sequence and coordinate the various element of mechanical work so that the mechanical plant will perform as indicated and be in harmony with the other work of the building. The Architect/Engineer will not supervise the coordination, which is the exclusive responsibility of the Contractor. Comply with the following requirements:
- B. Install ductwork and similar services straight and true, aligned with other work, close to walls and overhead structure (allowing for insulation), concealed where possible in occupied spaces, and out-of-the-way with maximum passageway and headroom remaining in each space.
- C. Arrange work to facilitate maintenance and repair or replacement of equipment. Locate services requiring maintenance on valves and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work.
- D. Locate operating and control equipment and devices for easy access. Install access panels where units are concealed by finishes and similar work.
- E. Integrate mechanical work in ceiling plenum with suspension system, light fixtures and other work, so that required performances of each will be achieved.
- F. Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).
- G. Where equipment is located above accessible ceilings, bottom of equipment shall not exceed 24" above ceiling height. All equipment shall be readily accessible to service personnel with service clearances as listed in installation instructions.
- H. Package heat pumps and gas packs installed on grade with horizontal duct connections to be elevated to allow trap installation. Structure to be galvanized C channel installed continuously all sides. Size of structure to match typical roof curb dimensions. No openings to occur in structure allowing vermin access below equipment.

1.5 INCIDENTAL WORK

- A. Provide all necessary foundations, supports, steel framework and protective guards. Equipment rails shall be THYCURB #TEMS, type appropriate for roof construction. Roof curbs shall be insulated, by equipment manufacturer or THYCURB #TC, type appropriate for roof construction.
- B. Install neoprene vibration isolation pads, equal to MASON type 'ND', under all heating and air-conditioning equipment w/moving parts, sized according to unit's weight.
- C. Permanent drain connections from air conditioning or heating units to floor drains, exterior or as indicated on drawings.
- D. Sleeves and inserts: Install sleeves of either steel or heavy sheet metal of the telescoping type 1/2" larger than the pipe or duct wherever it passes through walls and ceilings. Set sleeves before concrete is poured, masonry erected, walls plastered or floors finished.
- E. Flash all openings where ducts and pipes pass through roof or building walls.

1.6 PIPING:

- A. All piping shall be properly supported or suspended on stands, clamps, hangers, etc., to permit free expansion and contraction while minimizing vibration. Pipes shall be anchored by means of steel clamps or other approved means, securely fastened to the pipe and rigidly attached to the building construction. Refrigerant piping supports to be equal to Hydra-Zorb TRH
- B. On heat pumps and air conditioning units, suction and liquid refrigerant piping to be insulated.
- C. Refrigerant piping to be ACR copper with brazed joints for conventional split systems above five tons capacity and for variable refrigerant systems between heat pump and distribution system. Conventional systems 5 tons and less, mini-split systems, and branch piping on variable refrigerant systems to be pre-insulated copper linesets with abrasion resistant polyethylene outer layer. JMF EZ-Pull, Mueller Duraguard, or PDM Gelcopper
- D. Refrigerant piping insulation installed on exterior of building to polyethylene closed cell insulation with polyethylene hard shell outer jacketing. Equal to JMF EZ-Pull If standard black polyethylene insulation is installed, Techflex DuraWrap, Airex Eflexguard, or 0.020 aluminum to be added for protection of insulation.

1.7 CONDENSATE

- A. Primary condensate drain to discharge as shown on plan or to exterior of building or floor sink if no condensate drain is shown. Secondary condensate drain to discharge in location as to be noticed by tenant. Acceptable locations include above water closet, lavatory, bathtub, exterior door, etc. Do not discharge above kitchen sink or other food preparation areas.
- B. All evaporator coils located within a building and installed in a manner where condensate leakage would cause damage to structure or furnishings must be installed with auxiliary drain pan. Pan construction to be minimum 2" deep, 3" larger than evaporator coil, and minimum 20 ga. galvanized. Pan seams to be soldered. Drain pan is to have a float switch wired to low voltage power on the fan coil unit to interrupt power to unit if condensate levels reach 1" in depth.
- C. Condensate piping to be type 'M' copper.
- D. Condensate Drains: Consistent slope of 1/8" to 1/4" per foot to point of termination.
- E. Condensate drains to be insulated with 3/8" thick insulation applied as above. Install metal protector at all hanger points as indicated above.

1.8 SYSTEM CLEANLINESS

- A. All equipment, ductwork, and piping shall be sealed from weather, dust, and other contaminants at all times during construction. Store uninstalled materials with ends sealed in locations protected from weather. Once installed, seal ends of duct and pipe until final connections are made. Seal registers, grilles, and diffusers with plastic until systems are ready to be put in operation.

- B. No equipment shall be operated while building is under construction and dust and dirt are present from construction activities. All final wall coatings and floor finishes are to be installed and room shall be broom clean before operation is allowed. Approval of architect or engineer is required in any area prior to operation of hvac equipment. Contractor shall anticipate operation of equipment prior to substantial completion as directed by general contractor or project manager. Operation shall be utilized to maintain space conditions as required for acoustical ceilings and millwork. Maintain temporary filters secured to return grilles. Temporary filtration to be equal to American Air Filter frontline blue in 1" thickness.

1.9 WARRANTY

- A. The Contractor shall and hereby does warrant that all material and workmanship shall be of the quality, quantity and character specified and shown, and that any defect due to his non-compliance with the specifications and drawings, discovered and made known to him within one year after the date of substantial completion shall be made good by him without additional expense to the Owner.
- B. "Substantial Completion" is defined as completion sufficient for full and free use of the equipment by Owner for its intended purposes, even though not fully completed in every detail of balancing and adjustment, nor accepted, nor final payment made. The date of substantial completion shall be established in writing by the Owner upon application by the Contractor.
- C. Equipment to be furnished with a minimum of one year factory parts warranty from scheduled substantial completion. Equipment in which warranty begins at shipment or startup to be furnished with extended warranties as required to maintain factory warranty. Project schedule and construction time should be known at bid and utilized for warranty procurement.
- D. The one year warranty required by these specifications will be full maintenance type. Any necessary parts or labor, including filters, shall be included under one year warranty.
- E. Compressor units to have manufacturer's 5 year warranty.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND

EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.2 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Tags.
- C. Automatic Controls: Tags. Key to control schematic.
- D. Control Panels: Nameplates.
- E. Dampers: Ceiling tacks, where located above lay-in ceiling.
- F. Heat Transfer Equipment: Nameplates.
- G. Instrumentation: Tags.
- H. Major Control Components: Nameplates.
- I. Piping: Pipe markers.
- J. Pumps: Nameplates.
- K. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/4 inch.
- C. Background Color: Black.
- D. Plastic: Conform to ASTM D709.

2.3 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers and Smoke Dampers: Red.
 - 3. Heating/Cooling Valves: Blue.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR

HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.
- C. Measurement of final operating condition of HVAC systems.

1.2 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; 2005, Seventh Edition.

1.3 SUBMITTALS

- A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 1. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
 2. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.
 - f. Expected problems and solutions, etc.
 - g. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
 - h. Procedures for formal deficiency reports, including scope, frequency and distribution.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 6. Include the following on the title page of each report:

- a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Report date.
- C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 - PRODUCTS (SEE PLANS)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 1. AABC MN-1, AABC National Standards for Total System Balance.
 2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 2. Having minimum of three years documented experience.
 3. Certified by one of the following:
 - a. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Pumps are rotating correctly.
 14. Proper strainer baskets are clean and in place.
 15. Service and balance valves are open.

- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.6 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer
 - 2. Model/Frame
 - 3. HP/BHP
 - 4. Phase, voltage, amperage; nameplate, actual, no load
 - 5. RPM
 - 6. Service factor
 - 7. Starter size, rating, heater elements
 - 8. Sheave Make/Size/Bore
- B. V-Belt Drives:
 - 1. Identification/location
 - 2. Required driven RPM
 - 3. Driven sheave, diameter and RPM
 - 4. Belt, size and quantity

5. Motor sheave diameter and RPM
 6. Center to center distance, maximum, minimum, and actual
- C. Pumps:
1. Identification/number
 2. Manufacturer
 3. Size/model
 4. Impeller
 5. Service
 6. Design flow rate, pressure drop, BHP
 7. Actual flow rate, pressure drop, BHP
 8. Discharge pressure
 9. Suction pressure
 10. Total operating head pressure
 11. Shut off, discharge and suction pressures
 12. Shut off, total head pressure
- D. Combustion Equipment:
1. Boiler manufacturer
 2. Model number
 3. Serial number
 4. Firing rate
 5. Heat input
 6. Burner manifold gas pressure
 7. Flue gas temperature at outlet
 8. Ambient temperature
 9. Net stack temperature
 10. Percent stack loss
 11. Percent combustion efficiency
 12. Heat output
- E. Air Cooled Condensers:
1. Identification/number
 2. Location
 3. Manufacturer
 4. Model number
 5. Serial number
 6. Entering DB air temperature, design and actual
 7. Leaving DB air temperature, design and actual
 8. Number of compressors
- F. Chillers:
1. Identification/number
 2. Manufacturer
 3. Capacity
 4. Model number
 5. Serial number
 6. Evaporator entering water temperature, design and actual
 7. Evaporator leaving water temperature, design and actual

8. Evaporator pressure drop, design and actual
 9. Evaporator water flow rate, design and actual
 10. Condenser entering water temperature, design and actual
 11. Condenser pressure drop, design and actual
 12. Condenser water flow rate, design and actual
- G. Cooling Tower:
1. Tower identification/number
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Rated capacity
 6. Entering air WB temperature, specified and actual
 7. Leaving air WB temperature, specified and actual
 8. Ambient air DB temperature
 9. Condenser water entering temperature
 10. Condenser water leaving temperature
 11. Condenser water flow rate
 12. Fan RPM
- H. Heat Exchangers:
1. Identification/number
 2. Location
 3. Service
 4. Manufacturer
 5. Model number
 6. Serial number
 7. Steam pressure, design and actual
 8. Primary water entering temperature, design and actual
 9. Primary water leaving temperature, design and actual
 10. Primary water flow, design and actual
 11. Primary water pressure drop, design and actual
 12. Secondary water leaving temperature, design and actual
 13. Secondary water leaving temperature, design and actual
 14. Secondary water flow, design and actual
 15. Secondary water pressure drop, design and actual
- I. Cooling Coils:
1. Identification/number
 2. Location
 3. Service
 4. Manufacturer
 5. Air flow, design and actual
 6. Entering air DB temperature, design and actual
 7. Entering air WB temperature, design and actual
 8. Leaving air DB temperature, design and actual
 9. Leaving air WB temperature, design and actual
 10. Water flow, design and actual

11. Water pressure drop, design and actual
 12. Entering water temperature, design and actual
 13. Leaving water temperature, design and actual
 14. Saturated suction temperature, design and actual
 15. Air pressure drop, design and actual
- J. Heating Coils:
1. Identification/number
 2. Location
 3. Service
 4. Manufacturer
 5. Air flow, design and actual
 6. Water flow, design and actual
 7. Water pressure drop, design and actual
 8. Entering water temperature, design and actual
 9. Leaving water temperature, design and actual
 10. Entering air temperature, design and actual
 11. Leaving air temperature, design and actual
 12. Air pressure drop, design and actual
- K. Electric Duct Heaters:
1. Manufacturer
 2. Identification/number
 3. Location
 4. Model number
 5. Design kW
 6. Number of stages
 7. Phase, voltage, amperage
 8. Test voltage (each phase)
 9. Test amperage (each phase)
 10. Air flow, specified and actual
 11. Temperature rise, specified and actual
- L. Air Moving Equipment:
1. Location
 2. Manufacturer
 3. Model number
 4. Serial number
 5. Arrangement/Class/Discharge
 6. Air flow, specified and actual
 7. Return air flow, specified and actual
 8. Outside air flow, specified and actual
 9. Total static pressure (total external), specified and actual
 10. Inlet pressure
 11. Discharge pressure
 12. Sheave Make/Size/Bore
 13. Number of Belts/Make/Size
 14. Fan RPM

M. Return Air/Outside Air:

1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

N. Exhaust Fans:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

O. Duct Traverses:

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

P. Terminal Unit Data:

1. Manufacturer
2. Type, constant, variable, single, dual duct
3. Identification/number
4. Location
5. Model number
6. Size
7. Minimum static pressure

8. Minimum design air flow
 9. Maximum design air flow
 10. Maximum actual air flow
 11. Inlet static pressure
- Q. Air Distribution Tests:
1. Air terminal number
 2. Room number/location
 3. Terminal type
 4. Terminal size
 5. Area factor
 6. Design velocity
 7. Design air flow
 8. Test (final) velocity
 9. Test (final) air flow
 10. Percent of design air flow

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.
- B. Duct Liner.
- C. Insulation jackets.

1.2 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 2 years of experience and approved by manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, UL 723, ASTM E84, NFPA 255, UL 723, ASTM E84, NFPA 255, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 1200 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
 - 1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum service temperature: 450 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent.
 - 4. Maximum Density: 8.0 lb/cu ft.
- B. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.4 JACKETS

- A. Flexible Weatherproofing Jacket:
1. Alumaguard or equal

2.5 DUCT LINER

- A. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
1. Fungi Resistance: ASTM G21.
 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 3. Service Temperature: Up to 250 degrees F.
 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 5. Minimum Noise Reduction Coefficients:
 - a. 1 inch Thickness: 0.45.
- B. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- C. Liner Fasteners: Galvanized steel, self-adhesive pad, impact applied, or welded with integral head.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated ducts conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 3. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ducts conveying air above ambient temperature:
 1. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with Alumaguard All-Weather by Polyguard.
- E. External Duct Insulation Application:
 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- F. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.

3.3 SCHEDULES

- A. Exhaust Ducts Within 10 ft of Exterior Openings:
 1. Insulate as per schedule from exterior termination to 10' from exterior.
- B. Outside Air Intake Ducts:
 1. Insulate full length from intake location to unit connection.
- C. Supply Ducts:
 1. Insulate full length from unit discharge to termination.
- D. Return and Relief Ducts in Mechanical Rooms:
 1. Insulate full length from intake location to unit connection.
- E. Rectangular ductwork above major building insulation (attics, metal buildings with major insulation below ductwork, etc.) 1" thick, 2 lb. density duct liner on interior and 2" thick, 3/4 lb. density foil face fiberglass on exterior.
- F. Rectangular ductwork below building insulation 1" thick, 2 lb. density ductliner on interior.
- G. Round duct and fittings above major building insulation 3" thick, 3/4 lb. density foil face fiberglass on exterior.
- H. Round ductwork and fittings below building insulation 2" thick, 3/4 lb. density foil faced fiberglass on exterior.
- I. Ductwork on exterior of building to be insulated on interior with 1" ductliner and on exterior with 1" thick 4 p.s.f. rigid board fiberglass secured with adhesive and fasteners and covered on exterior with Polyguard products Alumaguard 60. Install as per manufacturers instructions.

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.

1.2 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Valves:
 - 1. Use service valves on suction and discharge of compressors.
- D. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
 - 2. Use a filter-drier on suction line just ahead of compressor.
 - 3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
 - 4. Use sealed filter-driers in systems utilizing hermetic compressors.

1.3 SUBMITTALS

- A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

PART 2 - PRODUCTS

2.1 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.
- B. Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 6. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 7. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

8. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
 - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.2 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.3 VALVES

- A. Ball Valves:
 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.
- B. Service Valves:
 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.4 STRAINERS

- A. Straight Line or Angle Line Type:
 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.5 FILTER-DRIERS

- A. Performance:
 1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
 2. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
 1. Sealed Type: Copper shell.
 2. Connections: As specified for applicable pipe type.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.

- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- H. Fully charge completed system with refrigerant after testing.

3.3 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using electronic leak detector. Test to no leakage.

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Kitchen hood ductwork.
- C. Dryer ductwork

1.2 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

1.3 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

PART 2 - PRODUCTS

2.1 DUCT ASSEMBLIES

- A. All Ducts: Galvanized steel, unless otherwise indicated.
- B. Low Pressure Supply (Heating Systems): 2 inch w.g. pressure class, galvanized steel.
- C. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. pressure class, galvanized steel.
- D. Medium and High Pressure Supply: 2 inch w.g. pressure class, galvanized steel.
- E. Return and Relief: 1 inch w.g. pressure class, galvanized steel.
- F. General Exhaust: 1 inch w.g. pressure class, galvanized steel.
- G. Dishwasher Exhaust: 1 inch w.g. pressure class, aluminum.
- H. Grease Exhaust: 6 inch w.g. pressure class, un-galvanized steel.
 - 1. Construct of ASTM A1011/A1011M 16 gage un-galvanized steel.
 - 2. Construction:
 - a. Liquid tight with continuous external weld for all seams and joints.
 - b. Where ducts are not self draining back to equipment, provide low point drain pocket with copper drain pipe to sanitary sewer.
 - 3. Access Doors:
 - a. Provide for duct cleaning inside horizontal duct at drain pockets, every 20 feet and at each change of direction.
 - b. Use same material and thickness as duct with gaskets and sealants rated 1500 degrees F for grease tight construction.
- I. Outside Air Intake: 1 inch w.g. pressure class, galvanized steel.
- J. Dryer exhaust: 1 inch w. g. pressure class, galvanized steel.

2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Un-Galvanized Steel for Ducts: ASTM A1008/A1008M, Designation CS, cold-rolled commercial steel.
- C. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.
- D. Stainless Steel for Ducts: ASTM A240/A240M, Type 304.
- E. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.

2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.
- F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct.
 1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
 2. Fittings: Manufacture with solid inner wall.
 3. Outer Wall: Paint grip galvanized steel.
 4. Inner wall: Perforated galvanized steel.
 5. Insulation:
 - a. Thickness: 1 inch fiberglass.
- B. Double Wall Insulated Round Ducts: Round spiral lockseam duct with paint grip galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
 1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
 2. Insulation:
 - a. Thickness: 1 inch.
 - b. Material: Fiberglass.
 3. Manufacturers:
- C. Fiber Glass Reinforced Plastic (FRP) Ducts: Glass fiber reinforced plastic, minimum 3/16 inch wall thickness.
- D. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
 1. Insulation: Fiberglass insulation with aluminized vapor barrier film.
 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 3. Maximum Velocity: 4000 fpm.
 4. Temperature Range: -20 degrees F to 210 degrees F.
- E. Dryer Exhaust: Minimum 26 gage single wall galvanized steel
 1. Wall inlet equal to Dryerbox #DB-480, 22 gage aluminized steel
 2. Duct elbows to be large radius of 2.5R (10"R) Dryer-EII LT-45 and Dryer-EII LT-90
 3. Dryer wall cap to be equal to Dryer Wall Vent DWV4

4. Where visible above dryer, install Dryer Placard #PLAC34 with calculated equivalent length printed in permanent marker.
5. Flexible connection between dryer and Dryerbox to be listed to UL2158A. Equal to DryerFlex. Secure to dryer and inlet duct with worm drive stainless steel clamps.

2.5 KITCHEN HOOD EXHAUST DUCTWORK

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, SMACNA Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines and NFPA 96.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards. All supports to be galvanized steel strapping minimum of 1" in width. Where round duct is insulated on exterior, supports to be installed on exterior of insulation with saddles to reduce compressing of insulation.
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Flexible Ducts: Connect to metal ducts with draw bands.
- D. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Duct access doors.
- C. Duct test holes.
- D. Fire dampers.
- E. Flexible duct connections.
- F. Volume control dampers.

1.2 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.
- D. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- E. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- C. Project Record Drawings: Record actual locations of access doors and test holes.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS - METAL

- A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.2 BACKDRAFT DAMPERS - FABRIC

- A. Fabric Backdraft Dampers: Factory-fabricated, 18 gage, galvanized steel frame.
 - 1. Blades: Neoprene coated fabric material.
 - 2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
 - 3. Maximum Velocity: 1000 fpm (5 m/sec) face velocity.

2.3 DUCT ACCESS DOORS

- A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
 - 1. Less Than 12 inches Square: Secure with sash locks.
 - 2. Up to 18 inches Square: Provide two hinges and two sash locks.

3. Up to 24 x 48 inches: Three hinges and two compression latches .

B. Access doors with sheet metal screw fasteners are not acceptable.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.5 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

C. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

E. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.7 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Splitter Dampers:

1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.

3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

1. Fabricate for duct sizes up to 6 x 30 inch.

2. Blade: 24 gage, minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

F. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.8 MISCELLANEOUS PRODUCTS

A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.

1. Thickness: 2 mils.

2. High tack water based adhesive.

3. UV stable light blue color.
4. Elongation Before Break: 325 percent, minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 233100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Demonstrate re-setting of fire dampers to Owner's representative.
- G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- J. Use splitter dampers only where indicated.

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Door grilles.
- D. Louvers.
- E. Louvered penthouses.
- F. Roof hoods.

1.2 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.3 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 - PRODUCTS (SEE PLANS)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Air inlet and outlet devices operating above or below ambient temperature to be insulated continuously to eliminate condensation and reduce heat transfer. 1" flexible glass fiber.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Nonmetallic-sheathed cable.
- C. Underground feeder and branch-circuit cable.
- D. Metal-clad cable.
- E. Wiring connectors.
- F. Wire pulling lubricant.
- G. Cable ties.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. For branch circuit wiring in dry locations within one- and two-family dwellings and their attached or detached garages, and their storage buildings.
 - b. For branch circuit wiring in dry locations within multifamily dwellings permitted to be of Types III, IV, and V construction.

2. In addition to other applicable restrictions, may not be used:
 - a. Where exposed to view.
 - b. Where exposed to damage.
 - c. For damp, wet, or corrosive locations.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Metal-clad cable is permitted only as follows:
 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

Maximum Length: 6 feet.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductor Material:
 1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
 4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.
- I. Minimum Conductor Size:
 1. Branch Circuits: 12 AWG.
- J. Conductor Color Coding:
 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:

Phase A: Brown.

Phase B: Orange.

Phase C: Yellow.

Neutral/Grounded Phase A: Gray with brown stripe.

Neutral/Grounded Phase B: Gray with orange stripe.

Neutral/Grounded Phase C: Gray with yellow stripe.

b. 208Y/120 V, 3 Phase, 4 Wire System:

Phase A: Black.

Phase B: Red.

Phase C: Blue.

Neutral/Grounded Phase A: White with black stripe.

Neutral/Grounded Phase B: White with red stripe.

Neutral/Grounded Phase C: White with blue stripe.

c. 240/120 V High-Leg Delta, 3 Phase, 4 Wire System:

Phase A: Black.

Phase B (High-Leg): Orange.

Phase C: Blue.

Neutral/Grounded Phase A: White with black stripe.

Neutral/Grounded Phase C: White with blue stripe.

d. 240/120 V, 1 Phase, 3 Wire System:

Phase A: Black.

Phase B: Red.

Neutral/Grounded Phase A: White with black stripe.

Neutral/Grounded Phase B: White with red stripe.

e. Equipment Ground, All Systems: Green.

f. Isolated Ground, All Systems: Green with yellow stripe.

g. Travelers for 3-Way and 4-Way Switching: Pink.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

a. Size 4 AWG and Larger: Type XHHW-2.

- b. Installed Underground: Type XHHW-2.
 - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.4 NONMETALLIC-SHEATHED CABLE

- A. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.

2.5 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.

2.6 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 3. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 5. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as shown on the drawings.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated and routing is not shown, determine exact routing required.
 - 3. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Install aluminum conductors in accordance with NECA 104.
- E. Install nonmetallic-sheathed cable (Type NM-B) in accordance with NECA 121.
- F. Install metal-clad cable (Type MC) in accordance with NECA 120.
- G. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- J. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):

- a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- K. Install conductors with a minimum of 12 inches of slack at each outlet.
- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. Make wiring connections using specified wiring connectors.
- 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
 - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements. .
- S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

1.2 RELATED REQUIREMENTS

- A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- E. Grounding Electrode System:
 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):
 - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
 - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
 - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal Building or Structure Frame:
 - a. Provide connection to metal building or structure frame effectively grounded in accordance with NFPA 70 at nearest accessible location.
4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
- F. Service-Supplied System Grounding:
 1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
 1. Provide grounding electrode system for each separate building or structure.
 2. Provide equipment grounding conductor routed with supply conductors.
 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- H. Separately Derived System Grounding:
 1. Separately derived systems include, but are not limited to:
 - a. Transformers (except autotransformers such as buck-boost transformers).
 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- I. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.2 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 260519:
1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - Use bare copper conductors where installed underground in direct contact with earth.
 - Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - a. Exceptions:
 - Use exothermic welded connections for connections to metal building frame.
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
- E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
- D. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 - PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a

- minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
 - B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported. External brackets to be equal to Steel City #SSF-SH2346, #52151-CM/52171 series or SBO series. Cady 'H' style brackets are not acceptable.
 - D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 2. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 3. Minimum Channel Thickness: 12 gauge.
 - E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - F. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.
 9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

END OF SECTION

SECTION 260534 - CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Conduit fittings.
- I. Accessories.

1.2 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
1. Under Slab on Grade: Use rigid PVC conduit. Transition to galvanized steel rigid metal elbow and stub-up where emerging from under slab. Paint metal elbow and stub-up with two(2) coats asphaltic paint or wrap with corrosion protection tape.
 2. Exterior, Direct-Buried: Use rigid PVC conduit.
 3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
- D. Embedded Within Concrete:
1. Within Slab on Grade: Not permitted.
 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet.
- N. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
 - c. HVAC equipment.
- O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.2 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size. (3/4" for University of Alabama projects)
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
 - 4. Underground, Interior: 3/4 inch (21 mm) trade size.
 - 5. Underground, Exterior: 1 inch (27 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.
- C. PVC-Coated Fittings:
 - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
- D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.6 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

2.7 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.8 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.9 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
- H. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- I. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.

- d. Across building exterior surfaces.
 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
- J. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
- K. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- L. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- M. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches. 36" for University of Alabama projects.
 2. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.
- N. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Secure conduits to prevent floating or movement during pouring of concrete.
- O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment.
- P. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- Q. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits penetrate coolers or freezers.
- R. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- S. Provide grounding and bonding in accordance with Section 260526.
- T. Identify conduits in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 260537 - BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Floor boxes.
- D. Underground boxes/enclosures.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.
 - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
 - 8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

PART 2 - PRODUCTS

2.1 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
 12. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
 13. Wall Plates: Comply with Section 262726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 2. Manufacturer: Same as manufacturer of floor box service fittings.
- E. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 2. Size: As indicated on drawings.
 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
 4. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
 - b. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
 5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

- a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels as required.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
 - 7. Fire-Resistance-Rated Walls: Install flush-mounted boxes such that the required fire-resistance will not be reduced.
 - 8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points.
- I. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- L. Floor-Mounted Cabinets: Mount on properly sized 3 inch high concrete pad.
- M. Install boxes as required to preserve insulation integrity.

N. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.
 2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using approved materials and methods.
- P. Close unused box openings.
- Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- R. Provide grounding and bonding in accordance with Section 260526.

3.2 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.3 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.

1.2 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

PART 2 - PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchboards:
 - Identify voltage and phase.
 - Use identification nameplate to identify main overcurrent protective device.
 - Use identification nameplate to identify load(s) served for each branch device.
Do not identify spares and spaces.
 - b. Panelboards:
 - Identify voltage and phase.
 - Identify power source and circuit number. Include location when not within sight of equipment.
 - Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

- c. Transformers:
 - Identify power source and circuit number. Include location when not within sight of equipment.
 - d. Enclosed switches, circuit breakers, and motor controllers:
 - Identify voltage and phase.
 - Identify power source and circuit number. Include location when not within sight of equipment.
 - Identify load(s) served. Include location when not within sight of equipment.
 - e. Enclosed Contactors:
 - Identify load(s) and associated circuits controlled. Include location.
 - f. Transfer Switches:
 - Identify voltage and phase.
2. Service Equipment:
- a. Use identification nameplate to identify each service disconnecting means.
 - b. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.
3. Emergency System Equipment:
- a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
 - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
5. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
- a. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
- B. Identification for Conductors and Cables:
- 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
- C. Identification for Raceways:
 1. Use painted raceways or painted raceways to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

Color Code:

Emergency Power System: Yellow .

Fire Alarm System: Red.

Data/Communications System: Blue.
- D. Identification for Boxes:
 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
- E. Identification for Devices:
 1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
- F. Identification for Luminaires:
 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:
 - a. Equipment designation or other approved description.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. System Designation: 1 inch.
 - b. Equipment Designation: 1/2 inch.
 5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
- D. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Power source and circuit number or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.

2.3 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch.
- F. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

- A. Minimum Size:
 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- B. Legend:
 1. Markers for Voltage Identification: Highest voltage present.
 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
- C. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
 1. Tape for Buried Power Lines: Black text on red background.
 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

- B. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conduits: Legible from the floor.
 - 8. Boxes: Outside face of cover.
 - 9. Conductors and Cables: Legible from the point of access.
 - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws, rivets, or rivets and to interior surfaces using screws or rivets.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 260928 - LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes a local networked lighting control system comprised of the following components which have the capability to create a centralized networked lighting control system utilizing optional components:
 - 1. System Software Interfaces
 - a. Smartphone Programming Interface for wired and wireless devices
 - 2. Wired Networked Devices
 - a. Wall Switches, Dimmers and Scene Controllers
 - b. Graphic Wall Stations
 - c. Auxiliary Input/Output Devices
 - d. Occupancy and Photocell Sensors
 - e. Relay and Dimming Power Packs, Secondary Packs, and Plug Load Controllers
 - f. Networked Luminaires
 - g. Relay and Dimming Panel
 - 3. Wireless Networked Devices
 - a. Sensor Interface
 - b. Light Controllers
 - c. Digital Sensor Attachments
 - d. Networked Luminaires
 - e. Communication Bridge
 - 4. Optional System Backbone and Integration Equipment
 - a. System Controller
 - b. OpenADR Interface
 - 5. Optional System Software Interfaces
 - a. Management and Visualization Interface
 - b. Historical Database and Analytics Interface
 - c. Personal Control Applications
 - d. Smartphone Programming Interface for wired devices
- B. The networked lighting control system shall meet all of the characteristics and performance requirements specified herein.
- C. The contractor shall provide, install, and verify proper operation of all equipment necessary for proper operation of the system as specified herein and as shown on applicable drawings.

1.2 SUBMITTALS

- A. Submittal shall be provided including the following items.
 - 1. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
 - 2. Riser Diagrams showing typical device wiring connections per room/area type with the option to show typical wiring connections for the system backbone and Information.
 - 3. Other Diagrams and Operational Descriptions - as needed to indicate system operation or interaction with other system(s).
 - 4. Shop Drawings indicating location of all components.

5. Contractor Startup/Commissioning Worksheet (must be completed prior to factory start-up).
6. Service Specification Sheets indicating general service descriptions, including startup, training, post-startup support, and service contract terms.
7. Hardware and Software Operation Manuals.

1.3 APPROVALS

- A. Prior approval from owner's representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.
- B. Any alternate product or system that has not received prior approval from the owner's representative at least 10 days prior to submission of a proposal package shall be rejected.
- C. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to owner's representative.
- D. For any alternate system that does not support any form of wireless communication to networked luminaires, networked control devices, networked sensors, or networked input devices, bidders shall provide a total installed cost including itemized labor costs for installing network wiring to luminaires, control devices, sensors, input devices and other required system peripherals.

1.4 QUALITY ASSURANCE

- A. Product Qualifications
 1. System electrical components shall be listed or recognized by a nationally recognized testing laboratory (e.g., UL, ETL, or CSA) and shall be labeled with required markings as applicable.
 2. System shall be listed as qualified under DesignLights Consortium Networked Lighting Control System Specification V2.0.
 3. System luminaires and controls are certified by manufacturer to have been designed, manufactured and tested for interoperability.
 4. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation.
 5. All components and the manufacturing facility where product was manufactured must be RoHS compliant.
- B. Installation and Startup Qualifications
 1. System startup shall be performed by qualified personnel approved or certified by the manufacturer.
- C. Service and Support Requirements
 1. Phone Support: Toll free technical support shall be available.
 2. Remote Support: The bidder shall offer a remote support capability.
 3. Onsite Support: The bidder shall offer onsite support that is billable at whole day rates.
 4. Service Contract: The bidder shall offer a Service Contract that packages phone, remote, and onsite support calls for the project. Response times for each type of support call shall be indicated in the terms of the service contract included in the bid package.

1.5 WARRANTY

- A. The manufacturer shall provide a minimum five-year warranty on all hardware devices supplied and installed. Warranty coverage shall begin on the date of shipment.
- B. The hardware warranty shall cover repair or replacement of any defective products within the warranty period.

1.6 MAINTENANCE & SUSTAINABILITY

- A. The manufacturer shall make available to the owner new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.

PART 2 - EQUIPMENT

2.1 MANUFACTURERS

- A. Basis of Design: Acuity NLight.
- B. Alternates: Touche, Cooper Greengate.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. System Architecture
 - 1. System shall have an architecture that is based upon three main concepts: (a) networkable intelligent lighting control devices, (b) standalone lighting control zones using distributed intelligence, (c) optional system backbone for remote, time based, and global operation between control zones.
 - a. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.
 - b. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wallstations without requiring connection to a higher level system backbone; this capability is referred to as "distributed intelligence."
 - c. System shall be capable of interfacing directly with networked luminaires such that either low voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches and system backbone (see Control Zone Characteristics sections for each type of network connection, wired or wireless).
 - 2. The system shall be capable of providing individually addressable switching and dimming control of the following: networked luminaires, control zones to include multiple switch legs or circuits, and relay and dimming outputs from centralized panels to provide design flexibility appropriate with sequence of operations required in each project area or typical space type. A single platform shall be used for both indoor and outdoor lighting controls.
 - 3. Lighting control zones shall be capable of being networked with a higher level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software.
 - 4. All system devices shall support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality at a later date.
 - 5. System shall be capable of "out of box" sequence of operation for each control zone. Standard sequence is:
 - a. All switches control all fixtures in a zone
 - b. All occupancy sensors automatically control all fixtures and plug load controllers in the control zone with a default timeout.
- B. Wired Networked Control Zone Characteristics
 - 1. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The "out of box" default sequence of operation is intended to provide typical sequence of operation so as to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.

2. System shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
 3. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
 - a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.
 - b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss of power sensed via line voltage connections.
 - c. Emergency egress devices shall be provided and UL labeled by the lighting control manufacturer.
- C. System Integration Capabilities
1. The system shall have the option to interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet/MSTP protocols.

2.3 SYSTEM SOFTWARE INTERFACES

- A. Portable Programming Interface for Standalone Local Control Zones
1. Portable handheld application interface allowing for configuration of lighting control settings shall be provided for standalone systems.
 2. Programming capabilities through the application shall include, but not be limited to, the following:
 - a. Switch/occupancy/photosensor group configuration
 - b. Manual/automatic on modes
 - c. Turn-on dim level
 - d. Occupancy sensor time delays
 - e. Dual technology occupancy sensor sensitivity
 - f. Photosensor calibration adjustment and auto-setpoint
 - g. Trim level settings
- B. Management Interface
1. System shall have the option to provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
 2. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®, and Mozilla Firefox®.
 3. All system software updates must be available for automatic download and installation via the internet.
- C. Historical Database and Analytics Interface
1. System shall have the option to provide a browser-based trending and monitoring interface that stores historical data for all occupancy/daylight sensors and lighting loads. Additionally, the system shall optionally upload that data to a cloud based server.
- D. Visualization Interfaces
1. System shall have the option to provide a web-based visualization interface that displays a graphical floorplan. System data, to include status of occupancy sensors, daylight sensors and light output shall be overlaid to the floorplan to provide a graphical status page.

2.4 WIRED NETWORKED DEVICES

- A. Wired Networked Wall Switches, Dimmers, Scene Controllers

1. Wall switches & dimmers shall support the following device options:
 - a. Number of control zones: 1, 2 or 4
 - b. Control Types Supported: On/Off or On/Off/Dimming
 2. Scene controllers shall support the following device options:
 - a. Number of scenes: 1, 2 or 4
 - b. Control Types Supported:
 - On/Off or On/Off/Dimming
 - Preset Level Scene Type

Reprogramming of other devices within local control zone so as to implement user selected lighting scene and with the option to select a lighting profile to be run by the system's upstream controller so as to implement a selected lighting profile across multiple control zones
- B. Wired Networked Graphic Wall Stations
1. Device shall have a full color touch screen.
 2. Device shall enable configuration of all local switches, dimmers, and lighting preset scenes via password protected setup screens.
 3. Graphic wall stations shall support the following device options:
 - a. Number of control zones: Minimum of 16
 - b. Number of scenes: Minimum of 16
 - c. Allow for password protection for user and/or setup screens
 - d. Allow for custom graphic image to be used as the default welcome screen
- C. Wired Networked Auxiliary Input / Output (I/O) Devices
1. Auxiliary Input/Output Devices shall be specified as an input or output device with the following options:
 - a. Contact closure input
 - Input shall be programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, ramp light level up or down, or toggle lights on/off.
 - b. 0-10V analog input
 - Input shall be programmable to function as a daylight sensor.
 - c. RS-232/RS-485 digital input
 - Input supports activation of up to 4 local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.
 - d. 0-10V dimming control output, capable of sinking a minimum of 20mA of current
 - Output shall be programmable to support all standard sequence of operations supported by system.
- D. Wired Networked Occupancy and Photosensors
1. Sensors shall utilize passive infrared (PIR) or passive dual technology (PDT) to detect both major and minor motion as defined by NEMA WD-7 standard.
 2. Sensor programming parameters shall be available and configurable both remotely via software and locally via the device.

3. Sensor mounting type shall match project design requirements as shown on plans.
 - a. Sensors shall have optional features for photosensor/daylight override, dimming control, and low temperature/high humidity operation.
4. The system shall support the following types of photocell-based control:
 - a. On/Off: The control zone is automatically turned off if the photocell reading exceeds the defined setpoint and automatically turned on if the photocell reading is below the defined setpoint. A time delay or adaptive setpoint adjustable behavior may be used to prevent the system from exhibiting nuisance on/off switching.
 - b. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to manually adjust the photocell setpoint and dimming rates, and allow for automatic setpoint calibration.
- E. Wired Networked Wall Switch Sensors
 1. Wall switches sensors shall support the following device options:
 - a. User Input Control Types Supported: On/Off or On/Off/Dimming
 - b. Occupancy Sensing Technology: PIR only or Dual Tech
 - c. Daylight Sensing Option: Inhibit Photosensor
- F. Wired Networked Embedded Sensors
 1. Embedded sensors shall support the following device options:
 - a. Occupancy Sensing technology: PIR only or Dual Tech
 - b. Daylight Sensing Option: Occupancy only, Daylight only, or combination Occupancy/Daylight sensor
- G. Wired Networked Relay and Dimming Power Packs, Secondary Packs, and Plug Load Controllers
 1. Devices shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
 2. Device programming parameters shall be available and configurable remotely via software and locally via the device push-button.
 3. Device shall be plenum rated.
 4. Devices shall be UL Listed for load and load type as specified on the plans.
- H. Wired Networked Luminaires
 1. Networked luminaire shall have a factory installed mechanically integrated control device and carry a UL Listing as required.
 2. Networked LED luminaire shall provide low voltage power to other networked control devices.
 3. System shall be able to maintain constant lumen output over the specified life of the LED luminaire (also called lumen compensation) by automatically varying the dimming control signal to account for lumen depreciation.
 4. System shall be able to provide control of network luminaire intensity, in addition to correlated color temperature of specific LED luminaires.
 5. Controls manufacturer is responsible for primary troubleshooting and tech support of complete fixture.
- I. Wired Networked Relay and Dimming Panel
 1. Relay and dimming panel(s) shall be capable of providing the required amount of relay capacity, as required per panel schedules shown on drawings, with an equal number of individual 0-10V dimming outputs.
 2. Standard relays used shall have the following required properties:

- a. Configurable in the field to operate with normally closed or normally open behavior.
- b. Provides visual status of current state and manual override control of each relay.
- c. Be individually programmable
3. 0-10 dimming outputs shall support a minimum of 100mA sink current per output.
4. Panel shall be UL924 listed for control of emergency lighting circuits.
5. Panel shall have the option for two (2) voltage barriers allowing for separation of 120VAC and 277VAC voltages and both normal and emergency circuits within a single panel.
6. Panel shall provide a contact closure input that acts as a panel override to activate the normally configured state of all relays (i.e., normally open or normally closed) in the panel.

2.5 OPTIONAL SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

A. Optional System Controller

1. System Controller shall be a multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
2. System Controller shall perform the following functions:
 - a. Facilitation of global network communication between different areas and control zones.
 - b. Time-based control of downstream wired and wireless network devices.
 - c. Linking into an Ethernet network.
 - d. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
 - e. Connection to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.
3. System Controller shall not require a dedicated PC, server, or cloud connection to function.
4. Device shall automatically detect all networked devices connected to it, including those connected to wired and wireless communication bridges.
5. Device shall have a standard and astronomical internal time clock.
6. Shall be capable of connecting to the customers Local Area Network (LAN) via IEEE 802.11.x Wireless and IEEE 802.3 Wired connection.
7. System Controller shall support BACnet/IP and BACnet/MSTP protocols to directly interface with BMS and HVAC equipment without the need for additional protocol translation gateways.
 - a. BACnet/MSTP shall support a minimum of 50 additional BACnet MS/TP controllers in addition to the Expansion I/O modules.
 - b. BACnet/MSTP shall support 9600 to 115200 baud.
 - c. System Controller shall be BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.
 - d. System controller must support BACnet/IP Broadcast Management Device (BBMD) and Foreign Device Registration (FDR).

B. Optional OpenADR Interface

1. System shall provide an interface to OpenADR protocol Demand Response Automation Servers (DRAS) typically provided by local electrical utility.
2. OpenADR interface shall meet all of the requirements of Open ADR 2.0a Virtual End Nodes (VEN), including:
 - a. Programmable with the account information of the end-user's electrical utility DRAS account credentials.

PART 3 - EXECUTION

3.1 **INSTALLATION REQUIREMENTS**

A. Installation Procedures and Verification

1. The successful bidder shall review all required installation and pre-startup procedures with the manufacturer's representative through pre-construction meetings.
2. The successful bidder shall install and connect the networked lighting control system components according to the manufacturer's installation instructions, wiring diagrams, the project submittals and plans specifications.
3. The successful bidder shall be responsible for testing of all low voltage network cable included in the bid. Bidder is responsible for verification of the following minimum parameters:
 - a. Wire Map (continuity, pin termination, shorts and open connections, etc.)
 - b. Length
 - c. Insertion Loss

B. Coordination with Owner's IT Network Infrastructure for Optional Centralized Networked Lighting Control System

1. The successful bidder is required to coordinate with the owner's representative to secure all required network connections to the owner's IT network infrastructure.
 - a. The bidder shall provide to the owner's representative all network infrastructure requirements of the centralized networked lighting control system.
 - b. The bidder shall provide, to the manufacturer's representative, all necessary contacts pertaining to the owner's IT infrastructure, to ensure that the system is properly connected and started up.

C. Coordination with Mechanical Division

1. The successful bidder shall provide all integration equipment detailed in Division 260943.
2. The successful bidder to verify integration scope with the Mechanical Contractor prior to submittal phase and provide all necessary schedules to the Lighting Control manufacturer.

D. Documentation and Deliverables

1. The installing contractor shall be responsible for documenting installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device addresses corresponding to locations of installed equipment.
2. The installing contractor is also responsible for the following additional documentation to the manufacturer's representative if visualization / graphical floorplan software is provided as part of bid package:
 - a. As-Built floor plan drawings showing wired network control zones outlined, in addition to device address locations required above. All documentation shall remain legible when reproducing drawing files for electronic submission.
 - b. As-Built electrical lighting drawings (reflected ceiling plan) in PDF and CAD format.
Architectural floor plans shall be based on as-built conditions.

CAD files shall have layers already turned on/off as desired to be shown in the graphical floorplan background images. The following CAD elements are recommended to be hidden to produce an ideal background graphical image:

Titleblock

Text- Inclusive of room names and numbers, fixture tags and drawings notes

Fixture wiring and homeruns

Control devices

Hatching or poché of light fixtures or architectural elements

CAD files shall be of AutoCAD 2013 or earlier. Revit file overall floor plan views shall be exported to AutoCAD 2013.

3.2 SYSTEM STARTUP

- A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed by an authorized representative of the manufacturer.
 - 1. Additional low voltage network cable testing shall be performed prior to system startup at the discretion of the manufacturer.
- B. System start-up and programming shall include:
 - 1. Verifying operational communication to all system devices.
 - 2. Programming the network devices into functional control zones to meet the required sequence of operation.
 - 3. Programming and verifying all sequence of operations.
 - 4. Customization of owner's optional software interfaces and applications.
- C. Initial start-up and programming is to occur on-site. Additional programming may occur on-site or remotely over the Internet as necessary.

3.3 PROJECT TURNOVER

- A. System Documentation
 - 1. Submit software database file with desired device labels and notes completed.
- B. Owner Training
 - 1. Provisions for onsite training for owner and designated attendees to be included in submittal package.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Load centers.
- D. Overcurrent protective devices for panelboards.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 - 2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Siemens Industry, Inc: www.usa.siemens.com.
- B. Eaton Corporation; Cutler-Hammer Products: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ALL PANELBOARDS

- A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.
- L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
- M. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- N. Load centers are acceptable for use in dwelling units only or where specifically indicated.

2.3 POWER DISTRIBUTION AND LIGHTING / APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
 2. Main and Neutral Lug Type: Compression.
- C. Bussing:

1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.
- D. Circuit Breakers:
 1. Provide bolt-on type.
 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
- E. Enclosures:
 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 2. Fronts:
 - a. No door: Provide nameplate adjacent to each overcurrent device.
 - b. With door:

Provide piano hinge trim with screw-retained, hinged cover for access to load terminals and wiring gutters and separate lockable, piano-hinged door for access to overcurrent device handles without exposing live parts.

Provide metal circuit directory holder welded to inside of door with clear plastic cover.

2.4 LOAD CENTERS

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:
 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 2. Bus Material: Copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 2. Provide individual circuit labels adjacent to circuit breakers.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 6. Provide the following circuit breaker types where indicated:

- a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
 8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), NEMA PB 1.1, NECA 1 (general workmanship), NECA 407 (panelboards), NEMA PB 1.1, NECA 407 (panelboards), NEMA PB 1.1, and NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 260529.
- E. Install panelboards plumb.
- F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- H. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.
- I. Provide minimum of four spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.
 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- M. Provide filler plates to cover unused spaces in panelboards.
- N. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 1. Emergency and night lighting circuits.
 2. Fire detection and alarm circuits.
 3. Communications equipment circuits.
 4. Intrusion detection and access control system circuits.

5. Video surveillance system circuits.

O. Identify panelboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 014000.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 400 amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262717 - EQUIPMENT WIRING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to equipment.

1.2 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Conform to NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Flexible Conduit: As specified in Section 260534.
- C. Wire and Cable: As specified in Section 260519.
- D. Boxes: As specified in Section 260537.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 262717

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.
- F. Poke-through assemblies.

1.2 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
 - 6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install wiring devices until final surface finishes and painting are complete.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (EXCEPT DIMMERS)

- A. Hubbell Incorporated: www.hubbell-wiring.com.
- B. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
- C. Bryant: www.bryant-electric.com
- D. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant receptacles for all receptacles installed in dwelling units.
- E. Provide GFI protection for all receptacles installed within 6 feet of sinks.
- F. Provide GFI protection for all receptacles installed in kitchens.
- G. Provide GFI protection for all receptacles serving electric drinking fountains.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.
- I. For flush floor service fittings, use tile rings for installations in tile floors.
- J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.3 ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes:
 - 1. As selected by architect..

2.4 WALL SWITCHES

- A. All Wall Switches: AC only, quiet operating, industrial specification grade snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: 90 degree connector with 6" stranded leads.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.5 WALL DIMMERS

- A. Manufacturers:
 - 1. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.

2. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 3. Hunt. huntdimming.com
- B. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.

2.6 RECEPTACLES

- A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498 and where applicable FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: 90 degree connector with 6" stranded leads.
 2. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, , listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
 3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, , listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- C. GFI Receptacles:
1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 3. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
- D. Switched Receptacles:
1. All nonlocking-type, 125-volt, 15- and 20-ampere receptacles that are controlled by an automatic control device, or that incorporate control features that remove power from the outlet for the purpose of energy management or building automation, shall be marked with the symbol shown in NEC Figure 406.3(E) and located on the controlled receptacle outlet where visible after installation.

2.7 WALL PLATES

- A. All Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 2. Size: Standard.
 3. Screws: Metal with slotted heads finished to match wall plate finish.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.

- E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.8 FLOOR BOX SERVICE FITTINGS

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com.
 - 2. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Description: Service fittings compatible with floor boxes provided under Section 260537 with all components, adapters, and trims required for complete installation.

2.9 POKE-THROUGH ASSEMBLIES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com.
 - 2. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches above finished floor.
 - b. Wall Dimmers: 48 inches above finished floor.
 - c. Receptacles: 18 inches above finished floor or 6 inches above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
 - D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
 - E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
 - F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - G. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
 - H. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
 - I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
 - J. Install wall switches with OFF position down.
 - K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
 - L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
 - M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
 - N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
 - O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
 - P. Identify wiring devices in accordance with Section 260553.
 - Q. Install poke-through closure plugs in all unused core holes to maintain fire rating of floor.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 014000.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 262818 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Siemens Industry, Inc: www.usa.siemens.com.
- B. Eaton Corporation; Cutler-Hammer Products: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA BS 31047, type HD (heavy duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Minimum Ratings:
 - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- M. Enclosures: Comply with NEMA BS 31047 and NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- O. Heavy Duty Switches:
 1. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 2. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- P. Provide the following features and accessories where indicated or where required to complete installation:
 1. Hubs: As required for environment type; sized to accept conduits to be installed.
 2. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close. Required for elevator disconnect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install enclosed switches in accordance with manufacturer's instructions.
- B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 260529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Identify enclosed switches in accordance with Section 260553.

3.2 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.3 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 263305 - BATTERY EMERGENCY POWER SUPPLY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Emergency power supply.

1.2 SUBMITTALS

- A. Product Data: Provide catalog and data sheets showing electrical characteristics and connection requirements. Include unit ratings, dimensions, and finishes. Include performance data for batteries.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. A.Digital Signal Power Manufacturer (DSPM).
- B. Emergi-lite
- C. Dual-lite

2.2 EMERGENCY POWER SUPPLY

- A. Description: NFPA 111 Type A, Class 1.5 stored emergency power supply system designed for Level 1 applications and consisting of rectifier/charger unit, storage battery, and solid state inverter with mechanical transfer switch, in one or several enclosures.

2.3 RATINGS

- A. Voltage and capacity as per drawings.
- B. Inverter Output Frequency: 60 Hz plus 1 percent.
- C. Efficiency: 90 percent minimum.
- D. Maximum Recharge Time: 12 hours following 1.5 hour discharge.
- E. Total Harmonic Distortion: Less than 10 percent at full resistive load.
- F. Battery: Lead calcium, sealed type battery.
- G. Instrumentation and Alarms: NFPA 111.
- H. Charger: Dual rate, designed to maintain battery in full-charge condition during normal conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install units plumb and level.

3.2 FIELD QUALITY CONTROL

- A. Verify operation of each unit by simulating outage.

3.3 CLOSEOUT ACTIVITIES

- A. Demonstrate normal operation of unit.

END OF SECTION 263305

SECTION 264300 - SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Surge protective devices for service entrance locations.
- B. Surge protective devices for distribution locations.
- C. Surge protective devices for branch panelboard locations.

1.2 ABBREVIATIONS AND ACRONYMS

- A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.
- B. SPD: Surge Protective Device.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
- C. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.
- D. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.6 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.7 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Factory-installed, Internally Mounted Surge Protective Devices:
 - 1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

2.2 ALL SURGE PROTECTIVE DEVICES

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service, listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated; system voltage as indicated on the drawings.
- B. Protected Modes:
 - 1. Wye Systems: L-N, L-G, N-G, L-L.
 - 2. Delta Systems: L-G, L-L.
 - 3. High Leg Delta Systems: L-N, L-G, N-G, L-L.
- C. UL 1449 Voltage Protection Ratings (VPRs):
 - 1. Equivalent to basis of design.
- D. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- E. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
- F. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.

2.3 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

- A. Unless otherwise indicated, provide factory-installed, internally mounted SPDs.
- B. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
- D. Surge Current Rating: Not less than 240 kA per mode/480 kA per phase.
- E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
- F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
- G. Diagnostics:
 - 1. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
 - 2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

2.4 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

- A. Unless otherwise indicated, provide factory-installed, internally mounted SPDs.
- B. List and label as complying with UL 1449, Type 1 or Type 2.
- C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
- D. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
- E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
- F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
- G. Diagnostics:
 - 1. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
 - 2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

2.5 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

- A. Unless otherwise indicated, provide factory-installed, internally mounted SPDs.
- B. List and label as complying with UL 1449, Type 1 or Type 2.

- C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
- D. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
- E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
- F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
- G. Diagnostics:
 - 1. Protection Status Monitoring: Provide indicator lights to report the protection status.
 - 2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
- B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- C. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

END OF SECTION

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Fluorescent emergency power supply units.
- F. Lamps.
- G. Luminaire accessories.

1.2 RELATED REQUIREMENTS

- A. Section 260537 - Boxes.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.
- B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.
- C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 101 - Life Safety Code; 2015.
- J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- K. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- L. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.
- M. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 1. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 1. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
 2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
 3. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.
- D. Samples:
 1. Provide one sample(s) of each luminaire proposed for substitution upon request.
 2. Provide one sample(s) of each product finish illustrating color and texture upon request.
- E. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.7 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.8 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all linear fluorescent ballasts.
- C. Provide five year pro-rata warranty for batteries for emergency lighting units.
- D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

PART 2 - PRODUCTS

2.1 LUMINAIRE TYPES

- A. Products: Subject to compliance with the requirements herein and the specifications, furnish products by manufacturers listed in Lighting Fixture Schedule on drawings or approved equal that meets the requirements and specifications stated herein and that is appropriate for use and fits properly in the work or subportion of the work specified herein and which will not compromise any manufacturer or contractor's warranties. If bidder proposes to use materials or equipment other than

that specified or stated as being acceptable, complete submittal data on proposed alternate equipment shall be submitted to Architect/Engineer at least ten (10) calendar days prior to bid date.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- H. Fluorescent Luminaires:
 - 1. Provide ballast disconnecting means complying with NFPA 70 where required.
 - 2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
 - 3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with two ballasts.
 - a. Luminaires with Two Lamps: Each ballast controls one lamp.
 - b. Luminaires with Three Lamps: One ballast controls two outer lamps and one ballast controls inner lamp.
 - c. Luminaires with Four Lamps: One ballast controls two outer lamps and one ballast controls two inner lamps.
- I. LED Luminaire Components: UL 8750 recognized or listed as applicable.
- J. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.
- K. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.3 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.4 EXIT SIGNS

- A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.
- B. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single or double as indicated or as required for the installed location.
 - 2. Directional Arrows: As indicated or as required for the installed location.
- C. Self-Powered Exit Signs:
 - 1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
 - 2. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
 - 3. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.5 BALLASTS AND DRIVERS

- A. All Ballasts:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Fluorescent Ballasts:
 - 1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
 - a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
 - b. Total Harmonic Distortion: Not greater than 20 percent.
 - c. Power Factor: Not less than 0.95.
 - d. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
 - e. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
 - f. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
 - g. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
 - h. Lamp Current Crest Factor: Not greater than 1.7.
 - i. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
 - j. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
 - k. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
 - l. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
 - m. Ballast Marking: Include wiring diagrams with lamp connections.
 - 2. Non-Dimming Fluorescent Ballasts:
 - a. Lamp Starting Method:
 - T8 Lamp Ballasts: Programmed start unless otherwise indicated.

T5 Lamp Ballasts: Programmed start unless otherwise indicated.

Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.

C. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

D. High Intensity Discharge (HID) Ballasts: Complying with ANSI C82.4 and listed and labeled as complying with UL 1029.

1. Electromagnetic Metal Halide Ballasts:

- a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 5 percent.
- b. Power Factor: Not less than 0.90 unless otherwise indicated.

2.6 FLUORESCENT EMERGENCY POWER SUPPLY UNITS

A. Manufacturers:

1. Iota Engineering, LLC www.iotaengineering.com.
2. Philips Emergency Lighting/Bodine: www.bodine.com/#sle.
3. Fulham Fire Horse: www.horse.fulham.com.

B. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Compatibility:

1. Ballasts: Compatible with electronic, standard magnetic, energy saving, and dimming AC ballasts, including those with end of lamp life shutdown circuits.

D. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamp(s) to the fluorescent emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

E. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.

2.7 LAMPS

A. Manufacturers:

1. General Electric Company/GE Lighting: www.gelighting.com/#sle.
2. Osram Sylvania: www.sylvania.com/#sle.
3. Philips Lighting Company: www.lighting.philips.com.
4. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.

B. All Lamps:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.

C. Incandescent Lamps: Wattage and bulb type as indicated, with base type as required for lighting fixture; 130 V rated.

1. Reflector Type Incandescent Lamps: Beam pattern as indicated.
2. Non-Reflector Type Incandescent Lamps: Inside frosted lamp finish unless otherwise indicated.
- D. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
 1. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
 2. Color Rendering Index (CRI): Not less than 80.
 3. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.
- E. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
 1. T8 Linear Fluorescent Lamps:
 - a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
 - b. Color Rendering Index (CRI): Not less than 80.
 - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
 2. T5 Linear Fluorescent Lamps:
 - a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
 - b. Color Rendering Index (CRI): Not less than 80.
 - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
- F. High Intensity Discharge (HID) Lamps: Wattage as indicated, with bulb type, burning position, and base type as required for luminaire.
 1. Metal Halide Lamps:
 - a. Non-Reflector Type Metal Halide Lamps: Phosphor coated lamp finish unless otherwise indicated.
 - b. Provide ANSI type O-rated protected metal halide lamps where required for open luminaires provided with compatible exclusionary sockets.
 - c. Ceramic Metal Halide Lamps:

Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.

Color Rendering Index (CRI): Not less than 80.

2.8 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 1 (general workmanship), and NECA 1 (general workmanship).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 4. In addition to ceiling support wires, provide four galvanized steel safety wire(s), minimum 12 gage, connected to each corner of each recessed luminaire to building structure.
- F. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- G. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Install canopies tight to mounting surface.
 - 4. Unless otherwise indicated, support pendants from swivel hangers.
- H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.
- L. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- M. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- N. Fluorescent Emergency Power Supply Units:
 - 1. For field-installed units, install inside luminaire unless otherwise indicated. Where installation inside luminaire is not possible, install on top of luminaire.
 - 2. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal ballast(s) in luminaire. Bypass local switches, contactors, or other lighting controls.
- O. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.6 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Exterior luminaires.
- B. Lamps.
- C. Poles and accessories.
- D. Luminaire accessories.

1.2 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260537 - Boxes.
- C. Section 262726 - Wiring Devices: Receptacles for installation in poles.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

PART 2 - PRODUCTS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings or equal.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.3 LAMPS

- A. All Lamps:
 - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.4 POLES

- A. All Poles:
 - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- F. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
 - 4. Install canopies tight to mounting surface.
 - 5. Unless otherwise indicated, support pendants from swivel hangers.
- G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- H. Pole-Mounted Luminaires:
 - 1. Foundation-Mounted Poles:
 - a. Provide cast-in-place concrete foundations for poles as shown on drawings.
 - b. Install foundations plumb.
 - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
 - f. Install anchor base covers or anchor bolt covers as indicated.
 - 2. Embedded Poles: Install poles plumb as indicated.
 - 3. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 - b. Provide supplementary ground rod electrode as specified in Section 260526 at each pole bonded to grounding system as indicated.
 - 4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
 - 5. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 262726 in designated poles.
- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.6 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 270001 - COMMUNICATIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Carefully examine General Conditions, other specification sections, and other drawings (in addition to electrical), in order to be fully acquainted with their effect on electrical work.
- B. Verify dimensions and existing conditions at the building. Obtain from manufacturer data on all equipment the dimensions of which may affect the installation.
- C. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Code (NEC), National Fire Protection Association (NFPA), Underwriters Laboratories, Inc. (UL), National Electrical Manufacturers Association (NEMA), EIA/TIA, BiCSi, American National Standards Institute (ANSI), and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspection, approvals, etc. and deliver such certificates to Architect/Engineer.
- D. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the condition of the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by workmen.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are complementary each to the other. What is called for by one shall be as binding as if 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 Contractor from performing such omissions and details of work, but they shall be performed as if fully and correctly set forth and described in the drawings and specifications. In any case of discrepancy in the figures or catalog numbers the matter shall be submitted to the Architect/Engineer, who shall promptly make a determination in writing. Electrical drawings are diagrammatical only. Do not scale these drawings.
- B. Except as above noted, make no changes in or deviations from the work as shown or specified except on written order of the Architect/Engineer.

1.3 VISIT TO SITE

- A. Contractor shall examine the site and be thoroughly familiar with all existing conditions before submitting his bid. Failure to do so will in no way relieve Contractor of responsibility under the Contract.

1.4 SCOPE OF WORK

- A. Arrange with local utility companies for such services as shown or herein specified.
- B. Major work included in Section 17 shall be:

1. Furnish and install a system of face plates, jacks, cables, speakers and equipment for telephone/paging system.
2. Furnish and install a system of face plates, jacks and cables for cable television system.
3. Furnish and install a system of face plates, jacks, cables, data/telecommunications equipment racks, patch panels, fiber optic cables and fiber optic panels for the Data System.

1.5 CLEARANCE WITH UTILITIES

- A. It shall be the responsibility of this contractor, prior to bid, to verify with the utility companies involved, that the locations arrangement and connections to utility service are in compliance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.

1.6 MANUALS AND INSTRUCTIONS

- A. Prior to final acceptance of the project, this Contractor shall furnish and deliver to the Owner four (4) bound manuals of instructions for operation and maintenance of all pieces of equipment and systems furnished under this division of the specifications. Such manuals shall clearly indicate the items furnished on the project. A list giving names and addresses of the of the nearest supply house carrying spare parts for all equipment furnished and the name of the installation subcontractor shall be given to the Owner. This Contractor shall also supervise the initial operation of all systems and equipment and shall verbally instruct the Owner as to operation and maintenance of all systems. Contractor to advise Architect by letter that the manuals and instructions as mentioned above have been given to Owner with copy of this letter to Engineer.

1.7 'AS BUILT' DRAWINGS

- A. Contractor shall prepare and turn over to the Architect one (1) set of Mylar reproducible drawings marked "AS BUILT" reflecting the actual work done. One (1) set of prints made from the Mylar drawings shall be furnished to the Engineer.

1.8 WARRANTY

SEE GENERAL CONDITIONS (ONE-YEAR WARRANTY OF CONFORMANCE WITH DRAWING AND SPECIFICATIONS). --

- A. In addition to the foregoing warranty, Contractor shall and does hereby warrant all materials and equipment furnished under this Section of the Specifications to be free from defects and to function or operate satisfactorily for one year after final acceptance of the work, and that any items not meeting this requirement will be made good by him without cost to the Owner, provided such defects or failures are not due to abuse, neglect, or lack of reasonable and ordinary maintenance.
- B. Cables shall be warranted by manufacturer for a minimum period of 15 years.

1.9 INSTALLER

- A. Qualifications of Data/Telecommunications Systems Installer:

1. The Data/Telecommunications Systems contractor shall be properly licensed and established in the business of data and telecommunications systems installation.
2. Data and Telecommunications System Project Manager shall have a minimum certification of Level II Installer by BiCSi. In lieu of BiCSi certified project manager, a Registered Communication Distribution Designer or IT tech may supervise installation with a minimum of 5 hours onsite each week of installation. Proof of Certification shall be provided prior to beginning installation.
3. Installers shall be certified by the cable manufacturer and the connectivity hardware manufacturer and the entire structured cabling system covered by a manufacturer/installer 15 year, minimum, warranty. Proof of Certification and Warranty agreement shall be provided prior to beginning installation.

PART 2 - PRODUCTS

2.1 APPROVED MATERIALS AND DEVICES

- A. Where not otherwise specified, provide only new, standard, first-grade materials throughout approved by Underwriter's Laboratories. Similar items of equipment shall be the product of the same manufacturer.
- B. If bidder proposes to use materials or equipment other than that specified or stated as being acceptable, complete submittal data on proposed alternate equipment shall be submitted to Architect/Engineer at least 10 working days prior to bid date.

2.2 SHOP DRAWINGS AND CATALOG DATA

- A. Submit to Architect/Engineer promptly after award of contract and prior to purchasing six (6) copies of manufacturer's shop drawings and catalog data for the following items. All shop drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of contract.

Cables	Patch panels
Cable terminations	Face plates and Jacks
Aux system equipment	ladder racks
Equipment racks	

- B. None of the above items shall be installed until shop drawing or catalog data has been accepted in writing. Any listed item not submitted shall be considered not acceptable, and shall be removed if directed.

2.3 MISCELLANEOUS ITEMS

- A. Backboards--Wood backboards shall be of 3/4" DEPA EXT-AC plywood painted with two coats of grey enamel both sides. Edges squared and trimmed to finish carpentry standards. Install securely and neatly. Size not less than shown; where no size is indicated, provide space to receive equipment plus 25% spare space.

2.4 CABLE HANGERS:

- A. Bridle Rings shall be 3" with wood screw heads equal to Senior Industries # SI-0063.
- B. J-hooks shall be 2" or 4" equal to B-Line #BCH32 or #BCH64 with cable retainers.
- C. J-hook Multi-tier supports shall be factory assembled units equal to B-Line BCH series hangers.
- D. All J-hooks shall be equipped with cable retainers equal to B-Line #BCHR Quik-Latch cable retainers of the proper size.

2.5 DATA AND TELECOMMUNICATIONS OUTLETS

- A. Data and Telecommunications outlets shall be modular, Category 6 outlets configured for T568B (AT&T) termination.
- B. Modules shall be mounted in brackets that allow use of standard receptacle faceplates. Brackets shall be the same color as the wiring device.
- C. The face of modules/jacks shall be flush with the face of the cover plate.
- D. Each outlet cover plate shall be capable of housing a minimum of four (4) data/telecommunications jacks.
- E. All unused jack ports shall be equipped with matching blank filler.
- F. Equal products by Leviton, Hubbell, or Pass & Seymour shall be acceptable.

2.6 PATCH PANELS

- A. Rack Mounted Cat 6 Patch Panel:
 - 1. 24 Port Patch Panel: The patch panels shall be 24 port , standard density, T568B (AT&T) Category 6, modular panels with 110-style punch down terminations. The panels shall be 2 rack units high.
 - 2. 48 Port Patch Panel: The patch panels shall be 48 port, standard density, T568B (AT&T) Category 6, panel with 110 style punch down terminations. The panels shall be 3 rack units high.
 - 3. Equal panels by Leviton, Hubbell, or Pass & Seymour shall be acceptable.
- B. Horizontal Cable Management Panels:
 - 1. Horizontal Cable Management Panels shall be feed through type, 1.7" high x 3.5" deep, to fit standard 19" wide rack and shall have four (4) 1" x 2" cutouts. The panels shall be 1 rack unit high.
 - 2. Equal products by Leviton, Hubbell, or Pass & Seymour shall be acceptable.
- C. Rack Mounted Fiber Optic Patch Panel:

1. Fiber Optic Cable Patch Cabinets shall be low profile, minimum 24 port, 19" rack mounted pre-loaded cabinets with phosphor bronze sleeves for termination of duplex, multimode and single mode fiber optic cables.
2. Adapters shall be Type SC with metal sleeves.
3. Face shall be recessed for jumper protection.
4. Patch panel shall mount in a standard 19" wide rack.
5. Equal products by Leviton, Hubbell, or Pass & Seymour shall be acceptable.

2.7 DATA/TELECOMMUNICATIONS EQUIPMENT RACKS

A. Floor Mounted Equipment Rack:

1. Racks shall be UL 7N69 and 1863 Listed.
2. Racks shall be 84" (45 rack units) tall and shall accept standard 19" wide equipment.
3. Frame shall be black powder coat aluminum.
4. The frames shall be predrilled and tapped with #12-24 threaded EIA hole pattern.

B. Vertical Cable Organizers:

1. Vertical Cable Organizers shall be Z-frame, 6" wide complete with cable channels, gates, and hinged covers.
2. Organizers shall come in 38.5" sections with two (2) sections per side.

C. Equal products by Leviton, Hubbell, or Pass & Seymour shall be acceptable.

2.8 CABLES

A. Cables shall be warranted for a period of 15 years by the manufacturer and installing contractor.

B. Data/Telecommunications Copper Cables

1. Category 6/Class D, four twisted pair, unshielded, 24 gauge copper cable complying with NFPA 70, NEMA WC 63, ANSI/TIA/EIA-568-B.1.
 - a. Individual pairs shall be constructed to contain a minimum two twists per inch per each pair.
 - b. Overall diameter of four pair cable shall not exceed 0.25 inches. Ultimate breaking strength shall be minimum 90 pounds.
 - c. Four pair cable shall withstand a bend radius of one inch minimum at a temperature of minus 20 degrees C maximum without jacket or insulation cracking. Conductors shall be color coded and polarized in accordance with EIA/TIA-568-A.
 - d. Cable shall be plenum rated where required.

2. Cables shall be manufactured by Berk-Tek, General Cable, or Superior Essex.
- C. Fiber Optic:
1. Single mode, 24 cond. equal to Essex #W30249101
 2. Multimode, 24 cond. equal to Essex #W30246G01
- D. Patch Cords: Category 6
1. ETL certified to TIA-568-B.
 2. Premium Cat 6 4-pair, 24 ga, stranded UTP cable.
 3. PVC, Snagless, slip-on boots.
 4. Manufactured by Ortronics, Hubbell, or approved equal.
- E. CATV Coax: RG-6 shielded
- F. Paging Speakers: Beldon #5502 FF 22/4

PART 3 - EXECUTION

3.1 SAFETY

- A. Maximum consideration shall be given to job safety and only such methods as will reasonably insure the safety of all persons shall be employed. The code and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

3.2 WORKMANSHIP

- A. All work shall be executed in a workmanlike manner and shall present a neat appearance with all items plumb and straight.

3.3 EXCAVATION, CUTTING AND PATCHING

- A. Perform all excavating and cutting as required to receive electrical work, and after inspection and approval of work by Architect/Engineer, do all required backfilling, patching and repairing. Obtain specific approval of Architect/Engineer before cutting into any structural members.
- B. For all such work employ competent workmen, and finish up in a neat and workmanlike manner equal to quality and appearance to adjacent work.

3.4 DATA AND TELECOMMUNICATIONS SYSTEMS

- A. All cables shall be installed by the Data/Telecommunications Contractor under the direct supervision of a BiCSi Level II installer, Registered Communications Distribution Designer or IT tech.
- B. Floor mounted racks shall be installed as detailed on the drawings.

- C. Equipment layouts shown for the equipment racks on the plans are intended to indicate the equipment to be supplied and installed by this contractor. Final layout of the equipment in the racks shall be approved and directed by the Owner.
- D. Each Data/Telecommunications outlet shall have a Category 6 unshielded 4 twisted pair cable installed from each jack to a patch panel on the Equipment Rack serving the area.
- E. Make all terminations at jacks and patch panel in accordance with industry standards.
- F. Cable installation
 - 1. Where cables are installed in conduit, the rated cable pulling tension of the cables shall not be exceeded. Cable shall not be stressed such that twisting, stretching shrinking occurs.
 - 2. Cable shall not be spliced.
 - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
 - 4. Placement of cable parallel to power conductors shall be avoided, if possible; a minimum separation of 12" shall be maintained when such placement cannot be avoided.
 - 5. All cables shall be terminated at both ends; no cable shall contain unterminated elements.
 - a. Data/Telecommunications outlet cables (Cat 6) shall be terminated on the jacks and the patch panels.
 - 6. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
 - 7. Cable bending radius shall be 1" minimum. Minimum bending radius shall not be exceeded during installation or once installed.
 - 8. Cables shall not come in contact with conduits, ceilings, lighting fixtures, ductwork, or water, sewer, or steam piping.
 - 9. Where support of the cables provided by the above systems exceeds 4 feet of span the Data/Telecommunications Contractor shall provide additional support by installing "J" hooks where necessary to provide support at 4 feet maximum spacing.
 - 10. 10. Cat 6 cables shall not be bundled with, installed in J-hooks or cable trays with, or installed in conduit with power circuiting or bell system circuiting.
 - 11. Cables routed through finished spaces which do not have suspended ceilings shall be installed in conduit. Routing of any exposed conduit shall be coordinated with the architect.
 - 12. Above inaccessible ceilings, cables shall be installed in EMT conduits. Conduits shall be terminated at each end with insulating bushings. Each end of conduit shall be easily accessible.

13. On backboards cables shall be supported on "D" rings at not more than 12 " on centers. Cables shall be attached to the "D" rings in vertical runs with nylon tie wraps.

3.5 CATEGORY 6 CABLE TESTING

- A. All category 6 circuits shall be tested using a test set that meets the Class II accuracy requirements of TIA/EIA TSB 67 standard, including the additional tests and test set accuracy requirements of ANSI/TIA/EIA-568-A-5.
- B. Testing shall use the Basic Link Test procedure of TIA/EIA TSB 67, as supplemented by ANSI/TIA/EIA-568-A-5.
- C. All metallic cable pairs shall be tested for proper identifications and continuity.
- D. All opens, shorts, crosses, grounds, and reversals shall be corrected. Correct color coding and termination of each pair shall be verified in the communications closet and at the outlet.
- E. Horizontal wiring shall be tested from and including the termination device in the communications closet to and including the modular jack in each room.
- F. Makes and model numbers of testing equipment shall be provided to the Engineer for approval prior to beginning installation.
- G. Each Category 6 Cable shall be tested in accordance with ANSI/TIA/EIA TSB-67 for Link Performance Verification.
- H. Each Pair of conductors in each cable shall be tested for the following:
 1. Wire Map
 2. Length
 3. Attenuation
 4. Near End Crosstalk Loss (NEXT): Tested from both ends of cables.
- I. Any cable(s) not meeting the minimum standards of ANSI/TIA/EIA TSB-67 shall be removed and replaced.
- J. Results of the tests for each cable shall be printed out with the name of cable as affixed to the cable and terminals on site.
- K. A bound copy and 4 compact disk copies of all test results shall be provided to Architect prior to job completion.

3.6 OPTICAL FIBER CABLE

- A. All optical fiber cable shall be installed in 2" EMT conduit above grade and RMC conduit below grade. After installation, conduits shall be permanently labeled as containing fiber optic cable.
- B. Innerduct may be installed from the horizontal runs of EMT down to the Data Racks.

- C. Optical fiber cables shall not be spliced. Each cable shall be continuous from Patch Cabinet to Patch Cabinet.
- D. All Optical fiber cable shall be pulled with hand power only. Pulling tension shall not exceed the cable manufacturer's rating. Torsion shall be avoided by the use of a swivel at the cable end. While under tension, a minimum bend radius of 20 times the outside cable diameter will be maintained through the use of pulleys and sheaves where required. After pulling, no bend may have a radius, at rest, or less than 10 times the outside cable diameter.
- E. Provide cable lubricant compatible with the cable sheathing material when pulling cable. Attach pulling fixtures to the cable strength members. When indirect attachments are used, match the grip diameter and length to the cable diameter and characteristics. When indirect attachment is used on cables having only central strength members, reduce pulling forces to ensure that fibers are not damaged from forces being transmitted to the strength member. During pulling of the cable, continuously monitor pull line tension and shall not exceed maximum tension given by the cable manufacturer. Mechanical stress placed upon the cable during installation shall be such that a cable is not twisted or stretched. Provide cable feeder guide between cable reel and face of duct or conduit to protect and guide cable into the duct or conduit as it played off the reel. As the cable is played off the reel, carefully inspect for jacket defects. Take precautions during the installation to prevent the cable from being kinked or crushed and to insure that minimum bend radius is not exceeded at any time. When practicable, use the center pulling technique to lower pulling tension.
- F. Each cable and conduit or inner duct is to be permanently labeled at each end with a unique cable number. In addition, labels shall be affixed to the cable and conduit/inner duct at every transition of a vault, hand hole, riser closet, or major pull box.
- G. Termination Standards
 - 1. The terminal ends of all fiber cable strands shall be field connectorized. The connectors shall be mounted on back boards and installed in enclosures called Fiber Integration Centers (FIC). Terminate both ends of all fibers within a fiber cable with SC style connectors.
- H. Fiber Organizers: Fiber cables are to be terminated in fiber optic cable patch panels installed where indicated on the drawings.
 - 1. Each enclosure shall be labeled with a machine made label with permanent black ink on a white background. Labels shall be in the format to identify each cable run as well as the fiber pairs of each run. Label shall be on the faceplate with the identifiers of the cables it contains.
 - 2. Each fiber optic strand shall be labeled with a unique identifier at the SC coupler in the FIC. Connectors shall be labeled on the identifying sheets on the front of the FIC.
 - 3. Connectors and Splices: Fiber ends are to be terminated in SC-type connectors with composite ferrules. They must be of the "epoxy and polish" or "crimp and polish" type. All runs are to be solid length point to point with no breaks to the termination points.

4. At each end of the cable, sufficient slack (10-15') shall be left to facilitate reasonable future relocation of the FIC. Slack shall be mounted on walls or ladder racks according to direction.

3.7 OPTICAL FIBER CABLE TESTING

- A. Before installation each individual fiber in each cable shall be tested with an adjustable OTDR for length and transmission anomalies while on the reel before installation.
 1. Perform tests on 100 percent of the fibers of each circuit and repeat from the opposite end of each circuit. Field tests shall include as a minimum:
 - a. Optical time domain reflectometer (OTDR) test at 850 nanometers, of the cable on the reel prior to installation. Calibrate OTDR to show anomalies of 0.2 dB as a minimum.
 - b. Scale of the OTDR trace shall be such that the entire circuit appears over a minimum of 80 percent of the X-axis.
 2. After installation, repeat the OTDR test in item 1 above. Replace cables that failed the test. Test new segment of cable to demonstrate acceptability.
- B. After installation
 1. High-resolution optical time domain reflectometer (OTDR) tests shall be performed from one end of each fiber.
 2. All single mode and multi mode fiber strands shall be tested end-to-end for bi-directional attenuation at 850 nm and 1300 nm.
 3. Tests should be conducted in compliance with TIA/EIA-526-14, Method B, according to the manufacturer's instructions for the test set being utilized.
 4. Tests must ensure that the measured link loss for each strand does not exceed the "worst case" allowable loss defined as the sum of the connector loss, (based on the number of mated connector pairs at the TIA/EIA-568 maximum allowable loss of 1.0 dB per mated pair), and the optical loss (based on the TIA/EIA-568 maximum allowable loss of 3.75 dB at 850 nm and 1.5 dB at 1300 nm).
 5. Before termination, each fiber shall be tested with an adjustable ODTR for length, transmission anomalies, and end-to-end attenuation. Results are to be recorded and supplied to Engineer in the form of hard-copy printouts.
 6. Termination connectors shall be visually inspected for scratches, pits or chips and shall be re-terminated if any of these conditions exist.
 7. Each terminated fiber is to be tested for end-to-end loss. As above, results are to be recorded and supplied to the Engineer.
 8. The maximum allowable attenuation for any splice or termination is 0.5 dB.

- C. Any fiber optic cable not meeting the minimum standards shall be removed and replaced or if it is determined that splices or terminations are at fault the splice or termination at fault shall be replaced and the cable retested.

3.8 LABELING

A. Cat 6 Cables:

1. Each jack, Cat 6 cable, and fiber optic cable shall be labeled with an alpha/numeric identifier with a corresponding identifier on the punch down block and/or patch panel.
2. The number shall include the alpha/numeric patch panel name and the alpha/numeric patch panel port name where the cable is terminated.
3. Labels shall be installed at each end of Cat 6 cables where terminated.
4. A floor plan of the facility shall be provided showing outlet locations and cable identifiers for each cable and the location of all patch panels with the corresponding identifiers.

B. Fiber Optic Cables:

1. Each fiber optic cable shall be labeled with an alpha/numeric identifier.
2. Each fiber in a fiber optic cable shall be labeled with an alpha/numeric identifier corresponding to the cable number, the patch panel number, and fiber identifier.
3. Labels shall be installed at each end of cables where terminated and on each fiber of each cable at the point of termination.
4. A floor plan of the facility shall be provided showing all patch panels with the corresponding identifiers, and cable identifiers for each cable at each patch panel.

END OF SECTION

SECTION 283100 - FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
 - 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 - 11. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
 - 12. Certification by Contractor that the system design complies with the contract documents.
 - 13. Do not show existing components to be removed.
- C. Evidence of installer qualifications.
- D. Inspection and Test Reports:
 - 1. Submit documentation of satisfactory inspections and tests.
- E. Operating and Maintenance Data: None - N/A; have one set available during closeout demonstration:
 - 1. Complete set of specified design documents, as approved by authority having jurisdiction.
 - 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 - 3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 - 4. List of recommended spare parts, tools, and instruments for testing.
 - 5. Replacement parts list with current prices, and source of supply.
 - 6. Detailed troubleshooting guide and large scale input/output matrix.
 - 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.

8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- F. Project Record Documents: None - N/A:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- G. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.2 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Fire alarm system installer must meet the requirements of the Alabama Certified Fire Alarm Act, including, but not limited to:
 - a. Installer must be licensed as a Certified Fire Alarm Contractor with a National Institute of Certification in Engineering Technologies (NICET) level III technician in a position of responsibility. The license will be issued in the name of the certificate holder and the contractor.
 - b. National Institute of Certification in Engineering Technologies (NICET) level II, or equivalent, certified technicians.
 2. Contractors wishing to bid on fire alarm work are to submit evidence of certifications required of the Certified Fire Alarm Act and that the contractor holds a permit issued by the State Fire Marshall at the mandatory pre-bid conference.
 3. Fire alarm system installer shall have a minimum of 5 years experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
 - a. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
1. Gamewell-FCI: www.gamewell-fci.com
 2. Notifier: www.notifier.com
 3. Edwards: www.edwardsfiresafety.com
 4. Simplex: www.simplexfire.com
- B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- C. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 5 years experience in the fire protective signaling systems industry.

2.2 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a complete, non-coded, addressable, microprocessor-based voice evacuation fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
 - 1. Provide all components necessary, regardless of whether shown in the contract documents or not.
 - 2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the State Fire Marshal.
 - c. The requirements of the local authority having jurisdiction.
 - d. Applicable local codes.
 - e. The contract documents (drawings and specifications).
 - f. NFPA 101.
 - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - 3. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
 - 4. Voice Notification: Provide emergency voice/alarm communications.
 - 5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
 - 6. Program notification zones and voice messages as directed by Owner.
- B. The fire alarm system shall be monitored by an approved supervising station in accordance with NFPA 72.
- C. Power Sources:
 - 1. Primary: Dedicated branch circuits of the facility power distribution system.
 - 2. Secondary: Storage batteries.
 - 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

2.3 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

2.4 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
 - 1. Sprinkler water control valves.
 - 2. Elevator shut-down control circuits.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 - 1. Sprinkler water flow.
 - 2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
 - 3. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.

4. Duct smoke detectors.
- C. Elevators:
1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
 2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
 3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.
- D. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
- E. Doors:
1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.
 2. Electromagnetic Door Locks on Egress Doors: Unlock in the direction of egress upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from.
 3. Overhead Coiling Fire Doors: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.

2.5 COMPONENTS

- A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit:
1. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems".
 2. The following FACP hardware shall be provided:
 - a. Power limited base panel with cabinet and door, 120 VAC input power.
 - b. 200 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
 - c. 200 points of Network Annunciation where one (1) point of annunciation equals:
 - (1) LED driver output on a graphic driver or (1) switch input on a graphic switch input module.
 - (1) LED on panel or (1) switch on panel.
 - d. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FCP LCD display.
 - e. Municipal City Circuit Connection with disconnect switch, 24 VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output.
 - f. One auxiliary, electronically-resettable, fused 2A @ 24 VDC output, with programmable disconnect operation for 4-wire detector reset.
 - g. One auxiliary relay, SPDT 2A @ 32 VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
 - h. Where required provide intelligent remote battery charger for charging up to 110AH batteries.

- i. Power supplies with integral intelligent Notification Appliance Circuit Class B for system expansion.
 - j. Four (4) form "C" auxiliary relay circuits (form C contacts rated at 2A @ 24 VDC, resistive), operation is programmable for trouble, alarm, supervisory, or other fire response functions. Relays shall be capable of switching up to 0.5A @ 24 VAC, inductive.
 - k. The FACP shall support (6) RS-232-C ports and one service port.
 - l. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
 - m. Modular Fiber Optic Network Communications Card.
 - n. Programmable DACT for either Common Event Reporting or per Point Reporting.
 - o. Service Port Modem for dial-in passcode access to all fire control panel information.
 - p. Power supply and municipal connection to be protected by transient voltage surge suppression.
3. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through style 4(class B) supervised serial communications channel (SLC):
- a. Addressable Signaling Line Circuits
 - b. Initiating Device Circuits
 - c. Notification Appliance Circuits
 - d. Auxiliary Control Circuits
 - e. Graphic Annunciator LED/Switch Control Modules
4. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to for a complete control unit, provide exactly matching modular unit enclosures.
5. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.
- D. NAC Power Extender:
- 1. the IDNet NAC power extender panel shall be a stand-alone panel capable of powering a minimum of 4 notification appliance circuits. Notification appliance circuits shall be class B style Y rated at 2 amps each. Panel shall provide capability to be expanded to 8 notification appliance circuits.
 - 2. The internal power supply and battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18 Ah batteries mounted in an external cabinet.
 - 3. The NAC extender panel may be mounted close to the host control panel or can be remotely located. The IDNet addressable NAC extender panel when connected to an addressable panel shall connect to the host panel via an IDNet communications channel. Via the IDNet channel each output can be individually controlled for general alarm or selective area notification.
 - 4. For IDNet connected NAC extender panels up to five panels can be connected on a single IDNet channel.
 - 5. When connected to a conventional (non-addressable panel) one or two standard notificatio appliance circuits from the main control panel may be used to activate all the circuits on the NAC power extender panel.
 - 6. Alarms from the host fire panel shall signal the NAC power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.

E. Remote Annunciators: None - N/A

1. Provide where required a remote LCD annunciator with the same "look and feel" as the FACP operator interface. The remote LCD annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs, and LCD display as the FACP.
2. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
3. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
4. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
5. The LCD shall display the following information relative to the abnormal condition of a point in the system:
 - a. 40 character custom location label.
 - b. Type of device (e.g. smoke, pull station, waterflow).
 - c. Point status (e.g. alarm, trouble).
6. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

F. Emergency Power Supply:

1. General: Components include battery, charger, and an automatic transfer switch.
2. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete fire alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 5 minutes.

G. Initiating Devices:

1. Manual Pull Stations:
 - a. Description: Addressable double-action type, red LEXAN, with molded, raised letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.
 - b. Protective Shield: Where required provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery-powered, piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield.
 - c. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.
2. Smoke Detectors:
 - a. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems". Include the following features:
 - Factory nameplate: Serial number and type identification.
 - Operating voltage: 24 VDC, nominal.
 - Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug

connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.

Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.

The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in the base to eliminate false addressing when replacing sensors.

Removal of the sensor head for cleaning shall not require the setting of addresses.

- b. Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type. Where acceptable per manufacturer specifications, ionization type sensors may be used.
 - c. Bases: Relay output, sounder, and isolator bases shall be supported alternatives to the standard base.
3. Duct Smoke Detectors: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.
- a. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.
 - b. The duct housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single form "C" contact rated at 7A @ 28 VDC or 10A @ 120 VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
 - c. Duct housing shall provide a relay control trouble indicator yellow LED.
 - d. Compact duct housing shall have a transparent cover to monitor for the presense of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
 - e. Duct housing shall provide two (2) test ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
 - f. Duct housing shall provide a magnetic test area and red sensor status LED.

- g. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
 - h. Each duct sensor shall have a remote test station with an alarm LED and test switch.
 - i. Where indicated provide NEMA 4X weatherproof duct housing enclosure that provides for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL listed to standard 268A.
4. Heat Detectors:
- a. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
 - b. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
 - c. Sensor fixed temperature setting shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
 - d. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.
5. Addressable Interface Devices:
- a. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
 - b. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two-wire pair running from an appropriate power supply as required.
 - c. There shall be the following types of modules:

Type 1: Monitor Circuit Interface Module

For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.

For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.

Type 2: Line Powered Monitor Circuit Interface Module

This type of module is an individually addressable module that has both its power and its communications supplied by the two-wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.

Type 3: Single-Address Multi-Point Interface Modules

This multipoint module shall provide location specific addressability for four initiating circuits and control two output relays from a single address. Inputs shall provide supervised monitoring of normally open, dry contacts and be capable of communicating four zone status conditions (normal, open, current limited, and short). The input circuits and output relay operation shall be controlled independently and disabled separately.

This dual point module shall provide a supervised multi-state input and a relay output, using a single address. The input shall provide supervised monitoring of two normally open, dry contacts with a single point and be capable of communicating four zone status conditions (normal, open, current limited, and short). The two-wire signaling line circuit shall supply power and communications to the module.

This dual point module shall monitor an unsupervised, normally open, dry contact with one point and control an output relay with the other point, using a single address. The two-wire signaling line circuit shall supply power and communications to the module.

Type 4: Line Powered Control Circuit Interface Module

This module shall provide control and status tracking of a form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.

Type 5: 4-20 mA Analog Monitor Circuit Interface Module

This module shall communicate the status of a compatible 4-20 mA sensor to the FACP. The FACP shall annunciate up to three threshold levels, each with custom action message; display and archive actual sensor analog levels; and permit sensor calibration date recording.

- d. All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

H. Notification Appliances:

1. Speakers: Cone type speaker shall be listed to UL 1480. The speaker shall have a minimum sound pressure level of 85 dBA @ 24 VDC. The speaker shall mount directly to a standard single gang, double gang, or 4" square electrical box without the use of a special adapter or trim rings.

2. Visible Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to a standard single gang, double gang, or 4" square electrical box without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 30cd, 75cd, and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific V/O appliance.
 3. Audible/Visible: Combination audible/visible (A/V) notification appliances shall be listed to UL 1971 and UL 1480. The strobe light shall consist of a xenon flash tube and associated lens/reflector system and shall be provided with different minimum flash intensities of 15cd, 30cd, 75cd, and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The speaker shall have a minimum sound pressure level of 85 dBA @ 24 VDC. The A/V enclosure shall mount directly to a standard single gang, double gang, or 4" square electrical box without the use of special adapters or trim rings.
 4. Notification appliance circuit shall provide synchronization of strobes at a rate of 1Hz and operate speakers. The circuit shall provide the capability to silence the audible signals while the strobes continue to flash over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.
 5. Accessories: The Contractor shall furnish the necessary accessories.
- I. Magnetic Door Holders:
1. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall operate from a 120 VAC, a 24 VAC, or a 24 VDC source and develop a minimum of 25 lbs. holding force.
 2. Material and Finish: Match door hardware.
- J. Locks and Keys: Deliver keys to Owner.
- K. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 2. Provide one for each control unit where operations are to be performed.
 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 4. Provide extra copy with operation and maintenance data submittal.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install system components and all associated devices in accordance with all applicable NFPA standards, manufacturer recommendations, and the contract documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

3.2 EQUIPMENT INSTALLATION

- A. Furnish and install a complete fire alarm system as described herein and as shown on the plans. Include sufficient control units, annunciators, manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary materials for a complete operating system. System shall be in full compliance with NFPA 72, NFPA 101, Americans with Disabilities Act, International Building Code, and all local codes and requirements. Any errors or omissions in plans and specifications shall not relieve the contractor from installing a fully compliant fire alarm system.

- B. Water-flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.
- C. Device Location Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

3.3 WIRING INSTALLATION

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. All system wiring to be in red, painted conduit.
- D. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - 1. Factory trained and certified.
 - 2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - 3. International Municipal Signal Association (IMSA) fire alarm certified.
 - 4. Certified by a state or local authority.
 - 5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- D. Final Test Notice: Provide a 10 day minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- H. Final Test, Certificate of Completion, and Certificate of Occupancy:
 - 1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.5 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean units internally using methods and materials recommended by the manufacturer.

- B. Occupancy Adjustments: When requested within 1 year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three (3) visits to the site for this purpose.

3.6 TRAINING

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train the Owner's maintenance personnel as specified below.
 - 1. Train Owner's maintenance personnel in procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
 - 2. Schedule training with the Owner at least seven (7) days in advance.

END OF SECTION

SECTION 285000 - RF SURVEY FOR IN-BUILDING TWO-WAY EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. The purpose of this specification is to establish the requirements and standards for the initial survey of the public safety radio signal strength per NFPA and IFC
- B. An initial survey to determine system requirements should be performed after the building is substantially completed (dried in) and prior to the start of installation of electrical wiring.
- C. Conduct an initial survey using an RF spectrum analyzer, a calibrated, system-compatible radio, or another suitable instrument with traceable certificate of calibration to analyze the RF signal strength of the Emergency Responder Radio Signal into the building and determine if amplification of the signal is required. Both inbound and outbound signal strength shall be measured and documented as required by the IFC.

1.2 SURVEY CRITERIA

- A. The required Public Safety Radio Signal Level inside the Owner's facility must be determined by the IFC, ordinance or AHJ.
- B. The initial survey shall be performed by an FCC licensed technician holding a current GROL license employed by the fire alarm contractor or another pre-approved agency meeting the personnel requirements of the IFC.

1.3 SUBMITTALS

- A. Submit testing data for each level of the building.
 1. An RF measurement drawing of each floor of the building which indicates relative RF field strength for each frequency band of interest must be submitted to the engineer of record and the AHJ.
 2. The drawing should indicate clearly the areas that have passed or failed based on the above parameters.

1.4 REFERENCED STANDARDS

- A. NFPA 1 - The National Fire Code (including Annex O from 2009)
- B. NFPA 70 - The National Electrical Code
- C. IFC 510 - Emergency Responder Radio Coverage
- D. NFPA 101 - Life Safety Code
- E. NFPA 72 - National Fire Alarm and Signaling Code
- F. FCC 47 CFR Private Land Mobile Radio
- G. 90.219 Services - Use of Signal Boosters
- H. ICC International Fire Code
- I. Local or State Promulgated Fire Code
- J. ADA "Americans with Disabilities Act"
- K. FCC's OET 65 Standards "Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields"
- L. FCC Rules Part 22, Part 90 and Part 101

- M. NFPA 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems
- N. ICC International Building Code
- O. UL 2524 2nd Edition

1.5 DEFINITIONS

- A. Bi-Directional Amplifier (Signal Boosters) / Fiber DAS Master & Remotes: Device used to amplify band-selective or multi-band RF signals in the uplink to the base station and in the downlink from the base station to subscriber devices for enhanced signals and improved coverage.
- B. In-building Two-way Emergency Responder Communication Enhancement System: A two-way radio communication system installed to assure the effective operation of radio communication for fire, emergency medical services, or law enforcement agencies within a building or structure.
- C. FCC: Federal Communications Commission
- D. OET 65 Standards: FCC's Bulletin 65 provides Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
- E. Public Safety/First Responder: Public Safety or First Responder agencies that are charged with the responsibility of responding to emergency situations. These include, but are not limited to, law enforcement departments, fire departments, and emergency medical companies.
- F. RSSI: Received signal strength indicator RSSI is a measurement of the power present in a received radio signal.
- G. BER: Bit Error Rate is the number of bit errors per unit time
- H. GROL: FCC General Radio Operators License
- I. ERCES: Emergency Responder Communication Enhancement System
- J. DAS: Distributed Antenna System

1.6 EXECUTION

- A. The initial survey shall follow the acceptance test procedure outlined in IFC 510.5.4. The minimum signal strength shall be as described in IFC 510.4.1 (RSSI measurement only).

END OF SECTION

SECTION 285001 - IN-BUILDING TWO-WAY EMERGENCY

RESPONDER COMMUNICATION ENHANCEMENT SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the contract including the General and Supplementary conditions of Division 1 of the specification sections, apply to the work of this section.

1.2 SUMMARY

- A. Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local AHJ (Authority Having Jurisdiction). System users shall receive and transmit radio signals from their portable radio units within the building. This shall be accomplished utilizing the following component:
 - 1. Bi Directional Amplifiers (Signal Boosters) / Fiber DAS Master & Remotes
 - 2. Coaxial Cable / Fiber Cable
 - 3. Antennas
 - 4. Cable taps
 - 5. Connectors
 - 6. Power Splitters
 - 7. Other components and interconnecting circuitry as required
- B. The system shall comply with the requirements of UL2524 2nd Edition Standard for In-building 2-Way Emergency Radio Communication Enhancement Systems, NFPA 72 2019 Edition, NFPA 1221 2019 Edition and IFC 2021.
- C. The entire system shall meet the requirements of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).
- D. The work in this section shall include the responsibility for all permit requirements with the AHJ. Where filings require engineer's signature, documents shall be submitted for his/her review and signature. This responsibility shall include furnishing of required quantities of floor plans, descriptive notes and/or specifications, wiring diagrams, shop drawings and amendment forms.
- E. Early completion of the in-building emergency radio communication enhancement system will be required as to permit a Certificate of Occupancy to be obtained in a timely manner
- F. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included
- G. The in-building two-way emergency responder communication enhancement system shall use a Fiplex by Honeywell signal booster or approved equal with UL2524 2nd edition listing from an Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratory (NRTL), NFPA 72, NFPA 1221 and IFC compliance.

1.3 DEFINITIONS

- A. NFPA: National Fire Protection Association
- B. IFC: International Fire Code
- C. IBC: International Building Code
- D. AHJ: Authority Having Jurisdiction
- E. UL: Underwriters Laboratory

1.4 CODES AND STANDARDS

- A. NFPA72 2019 – National Fire Alarm Code
- B. NFPA 1221 2019 – Standard for Installation, Maintenance, and Use of Emergency Services Communications Systems
- C. IFC 2021 – International Fire Code
- D. UL 2524 – Standard for In-Building 2-Way Emergency Radio Communication Enhancement Systems
- E. Local codes and standards

1.5 DESIGN REQUIREMENTS

- A. In-building two-way emergency responder communication enhancement systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.
- B. Critical Areas such as emergency command center, fire pump room, exit stairs, exit passageways, elevator lobbies, standpipe cabinets, sprinkler sectional valve locations and similar critical areas as specified by AHJ shall be provided with 99% floor area radio coverage.
- C. General building areas shall be provided with 95% radio coverage, or as specified by AHJ.
- D. The In-building emergency radio communication enhancement systems must provide the following signal strengths:
 - 1. Minimum DAQ of 3.0 or better and equivalent signal to interference noise ratio (SINR) applicable to the technology for either analog or digital.
 - 2. Downlink - Minimum signal strength of -95 dBm throughout the coverage area.
 - 3. Uplink - Minimum signal strength of -95 dBm received at the AHJ Radio System OR as otherwise required by the AHJ.
- E. The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.
- F. An approved manufacturer or a qualified and approved vendor shall supply, test and determine locations of components which are required for proper operation as well as to supply, install, test and certify the performance of the complete system. Vendor qualifications must be acceptable to the AHJ.
- G. Design shall include iBwave software-simulated radio propagation modeling with heat maps showing predicted signal coverage levels within the building. The iBwave design shall be done by iBwave level 2 or higher certified personnel.
- H. All tests shall be conducted, documented, and signed by a person in possession of an FCC General Radio Telephone Operators License. All testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must be acceptable to the AHJ.
- I. The system design shall be based on the Fiplex by Honeywell line of Public Safety Signal Boosters / Fiber DAS or equivalent UL2524 2nd Edition, NFPA 72, NFPA 1221, IFC and FCC certified to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waive any requirement or performance of individual components described in the specifications.
- J. Assembly and installation of all components of the In-building Two-way Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.
- K. Survivability from attack by fire shall meet requirements of NFPA 72, NFPA 1221, IFC or as required by the local jurisdiction.
- L. The system must comply with all applicable sections of the FCC rules. Signal booster / Fiber DAS Master/Remote shall have FCC certification prior to installation.

- M. Antenna isolation shall be maintained between the donor antenna and all inside antennas (DAS) to a minimum of 20dB under all operating conditions.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The system specified shall be based upon Fiplex by Honeywell line of Public Safety UL2524 2nd Edition, NFPA72, NFPA 1221, IFC compliant signal boosters / Fiber DAS Master/Remote.
- B. The system shall be Public Safety type with Class A or Class B signal booster or Fiber DAS Master/Remote, as designated by the FCC or as required by the AHJ.
- C. The secondary power supplies, battery chargers and system monitoring shall be fully compliant with UL2524 2nd Edition, NFPA 72, NFPA 1221 and IFC. The signal booster shall have both the primary and the secondary power supplies within a waterproof, type-4 approved enclosure.
- D. All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be displayed on the product as required by the FCC.
- E. The digital signal booster shall be capable of field configuration via programmable software for the frequency channels with adjustable bandwidths as specified by the AHJ.
- F. 700MHz & 800MHz + FirstNet Band 14, VHF, UHF signal boosters shall support both Class A and Class B operation. Signal boosters shall be channel selective type with 150KHz, 100KHz, 75KHz, 62.5KHz, 50KHz, 37.5KHz, 25KHz, and 12.5KHz. channel bandwidth options. Non-selective wide-band signal boosters shall not be accepted, unless required to cover multiple channels within the same band.
- G. Signal Boosters shall have oscillation suppression circuitry to protect the public safety radio system in case of system malfunction or other causes. This signal booster circuitry shall allow real time automated oscillation correction and immediate detection capable of generating an oscillation alarm, combined with programmable limited operation or auto-shutdown if performance migration fails.
- H. Signal Boosters must have uplink noise suppression function to eliminate uplink noise while in standby (i.e. no radio transmission from within a building). Systems that produce any measurable level of uplink noise while in standby shall not be acceptable.
- I. Signal booster must have uplink, and downlink squelch per channel per timeslot.
- J. Signal Booster gain shall be rated at minimum of 85dB +/- 2.0dB and the gain shall be adjustable in a minimum of 28dB range. System gain shall be set and documented at the time of the final system test.
- K. Maximum propagation delay of the signal booster system shall be adjustable in the signal booster to comply with system requirement or as specified by the AHJ. Signal booster shall offer filter delay options. Maximum propagation delay shall be within the minimum Range of 3.5µS (microseconds) to a maximum of 61.5µS (microseconds).
- L. Signal Booster shall produce no more than a maximum of 9dB noise throughout its published operable uplink gain range.
- M. The signal booster system shall include built-in automatic supervision of malfunctions of the signal booster and battery systems as per NFPA 1221, NFPA 72 and IFC. Non-OEM equipment add-ons and modifications to comply with this specification shall not be acceptable.
- N. A dedicated supervised monitoring panel shall be provided within the emergency command center next to the fire alarm panel / annunciator or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
1. Normal AC power
 2. Signal booster trouble

3. Antenna Failure
 4. Loss of normal AC power
 5. Failure of battery charger
 6. Low battery capacity
 7. Active System component failure
- O. Signal booster shall meet Buy American compliance requirements
- P. If the signal booster is supervised by other brand FACP, the signal booster system shall be Fiplex by Honeywell branded model with universal normally open relays for connection to external monitoring modules; if supervised by Honeywell brand FACPs, provide the option to install the FACP monitor module inside the Battery Backup Unit.
- Q. External filters, duplexers, power supplies or other non-OEM additions or modifications of the original equipment shall not be acceptable with the exception where technically required so long as it does not violate the UL2524 2nd edition certification. If required, the external filters should be manufactured or certified by the manufacturer.
- R. All signal booster components shall be contained in a type-4 approved waterproof enclosure. All enclosures shall be painted red with external labeling as required by the AHJ.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Installation of all components of the In-building Two-way Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code NFPA-70, NFPA-72, NFPA 1221, IFC or as required by the local AHJ.
- B. At least 2 independent and reliable power supplies shall be provided as required in NFPA 72, NFPA 1221 and IFC.
- C. The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, NFPA 72 and NFPA 1221 2016 edition.
1. The signal booster shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall power on automatically when the primary power source is lost. The secondary source of power shall be capable of operating the in-building two-way emergency responder communication enhancement system for a period of at least 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a waterproof Type-4 approved enclosure. Batteries shall be enclosed in a NEMA-4 rated enclosure. External UPS (Uninterruptable Power Supplies) are not acceptable.
- D. RF Coaxial Cable shall be a listed, CMP plenum, or armored plenum coaxial cable or 2-hour fire rated plenum coaxial cable. Non-plenum cable can be used when installed in a metallic raceway. The cable classification shall be clearly marked on the outer surface of the cable regular intervals.
- E. All installed systems will need prior written approval from the FCC license holder of the systems being re-amplified and must meet their established criteria for installation prior to the system installation.
- F. Installed systems shall be registered with the FCC signal booster registry where required.

3.2 ACCEPTANCE AND TEST PROCEDURES

- A. Acceptance testing for an in-building two-way emergency responder communication enhancement system is required upon completion of installation.
- B. The coverage testing shall be done in accordance with NFPA 72, NFPA 1221, IFC and as required by the local AHJ.

- C. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.
- D. All test records along with system diagrams, iBWave design, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted to the engineer of record and the AHJ upon completion of the project and shall also be stored within a document box adjacent to the FACP.

3.3 ANNUAL MAINTENANCE AND PROOF OF COMPLIANCE

- A. The in-building two-way emergency responder communication enhancement system shall always remain in operation in accordance with IFC.
- B. The system shall be tested annually as part of routine maintenance or when structural changes, additions or space layout configurations can affect the initial coverage areas.
- C. As part of annual testing the signal booster shall be verified for loss of gain from when the system was originally commissioned.
- D. All power supplies and batteries shall be tested for loss of power and communication failure.
- E. Upon completion of the annual test, a report shall be provided to the owner and local AHJ.

END OF SECTION

SECTION 311000 - SITE PREPARATION, GENERAL

PART 1 - GENERAL

1.1 WORK INCLUDED

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

END OF SECTION 311000

SECTION 311100 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 WORK INCLUDED

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

1.2 CLEARING

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

1.3 GRUBBING

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

1.4 CLEARING AND GRUBBING LIMITS

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

1.5 DISPOSAL OF MATERIALS

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

END OF SECTION 311100

SECTION 312000 – GEOTECHNICAL REPORT

See attached Geotechnical Report.



3200 Rice Mine Rd. NE
Tuscaloosa, AL 35406
205.345.0816
www.TTLUSA.com

July 25, 2025

Mr. Jordan Morris, AIA
Ward Scott Morris Architecture
1606 Paul W. Bryant Drive
Tuscaloosa, Alabama 35401

**RE: Geotechnical Report
Verbena High School Gymnasium and Athletic Improvements
Verbena, Chilton County, Alabama
TTL Project No. 000250101196.00**

Dear Mr. Morris:

TTL, Inc. (TTL) is pleased to submit this Geotechnical Report for the subject project. The purposes of our services were to explore subsurface conditions at the site and develop geotechnical recommendations for the project.

Project Information

The project site is located at the existing Verbena High School football facility on County Road 510 in Verbena, Alabama. The overall project is expected to include demolishing and replacing the existing concession stand and restrooms, new ticket booth/entry plazas on the north and south end of the football field, new asphalt parking lot, new gymnasium, and a paved walkway around the football field. The project will also include re-striping of the existing parking lot and new fencing, but there will not be work on the field. Recommendations for the project elements such as resurfaced walkways, relocating the fence are not included in our scope of services.

The new parking areas will be asphalt paving. Estimated traffic consists of mostly passenger vehicles with the occasional delivery, garbage truck, and school buses for event parking. We assume grading for the parking lot will require cuts/fills of 2 feet or less.

We expect the proposed new concession stand/restroom and ticket booths will be constructed with concrete masonry units (CMU) walls with brick veneer on the outside supported by a slab-on-grade with turndowns. A grading plan has not been finalized; however, we assume fills will be less than about 2 feet. We anticipate wall loads will be about 2 kips per linear foot.

TTL understands that the new gymnasium will be a pre-engineered metal building with some CMU walls and a slab-on-grade floor. We anticipate fills will be less than about 4 feet. Structural loading was not finalized at the time of this report; however, we anticipate maximum column loads will be 100 kips and wall loads will be less than 2 kips per linear foot.

Site Conditions

The approximate location of the gymnasium is a landscaped area with sparse mature trees and playground equipment. The ground surface gently slopes down to the northeast with approximately 5 feet of relief. At the location of the concession stand/restroom, there is currently an existing building that will be demolished and replaced. The north ticket booth is planned to be in gravel drive along the southeast side of the school. The south ticket booth will be in the existing gravel parking area south of the football field. The ground cover in the area consists of grass, asphaltic pavement, and gravel. A Site Location Map illustrating the location of the site is appended to this report.

Historical Google Earth aerial imagery shows that there were two structures in and near the footprint of the proposed gymnasium and parking lot. It is unknown if this structure had a septic tank or other underground utilities. It is possible that remnants of the structure including foundations may be buried at this site.

Area Geology

According to the United States Geological Survey, the site is located in the Coastal Plain physiographic region and is mapped as underlain by the Coker Formation within the Tuscaloosa Group. This formation typically consists of light-colored micaceous clay with a few thin gravel beds containing quartz and chert pebbles. The quartz and chert gravels at the base of the formation range from very fine pebbles to large cobbles in size. These soils can vary in composition, layering, moisture conditions, and consistency (strength and stiffness) both vertically and laterally because of the complex depositional environment and repeated episodes of deposition and scour.

Subsurface Conditions

A total of 10 soil test borings were drilled across the site to explore the subsurface conditions. Four borings were drilled in the area of the new gymnasium and associated parking area, two borings were drilled near the proposed concession stand/restroom, two borings were drilled for the proposed ticket booths (one each), and two borings were in the area of proposed paved walkway around the football field. Borings were located at the site by TTL engineering personnel. The approximate boring locations are shown on the Exploration Location Plan appended to this report.

The soil test borings were advanced by a track mounted drilling rig (Geoprobe) to depths of about 5 to 15 feet below ground surface (bgs). Standard penetration tests (SPT) were performed in the borings with at least four samples in the upper 10 feet and then at approximately 5 foot intervals to boring termination. After the penetration resistance values (N-values) were recorded, soil samples were taken from the sampling device, visually classified, placed in bags and transported to our laboratory for further testing and review by our engineering staff.

At the ground surface, the borings encountered 2 to 12 inches of topsoil in borings B-01, B-02, B-03, B-04, B-06, B-07, and B-10. Boring B-08 encountered 6 inches of asphalt followed by 2 inches of crushed aggregate base; however, in boring B-09 approximately 2 inches of crushed aggregate was underlain by 1 inch of asphalt. Boring B-05 encountered 2 inches of gravel at the ground surface. The soils encountered were generally clayey sand (USCS – SC) and sandy lean clay (USCS – CL). The consistency of the sandy lean clay ranged from very soft to hard (N-value of 1 to 39). The clayey sand exhibited a consistency of medium dense to dense (N-value of 17 to 45). Low consistency soils (N-value of 6 or less) were encountered in the upper 3 feet in the borings except for B-01 and B-05.

Groundwater was not encountered at the time of drilling. Delayed groundwater readings were not measured due to drilling/mobilization being completed in one day.

One of our borings encountered possible existing fill including observations of bricks, glass, and metal scraps. Based on our limited sampling, the fill material is typically soil, but may include debris and spoil material, placed by the actions of man. Fill can be problematic for site development when it is a material with undesirable constituents such as deleterious materials and/or has not been compacted in thin lifts. Uncompacted or poorly compacted fill can be a source of unpredictable and excessive settlements or other expressions of poor structural performance. Fill that has been placed without engineering observation or documentation can sometimes contain objectionable inclusions or constituents, such as tree trunks, brush piles, topsoil, junk, debris, trash, excessively wet or high plasticity soils, silty soils, or large rock boulders. When such undesirable inclusions are present, the fill may perform poorly when used to support buildings, pavements, and flatwork. The consistency or density of the fill cannot necessarily be correlated with conventional indicators, such as drive-sample blow counts or estimates of unconfined compressive strength of cohesive soils. Before grading, we recommend having our engineer observe several test pit excavations to better define the horizontal and vertical extent of the fill. This material should be removed prior to grading. A determination can be made on whether the existing fill material can be reused as fill based on the test pits.

Additional information about the subsurface stratigraphy encountered at the boring locations is provided on the boring logs appended to this report. The boring logs represent our interpretation of the subsurface conditions at the boring locations based on tests and observations performed during the drilling operations, classification of the soil samples by a geoprofessional, and laboratory tests conducted on selected soil samples. The lines designating the interfaces between various strata on the boring logs represent the approximate strata boundaries; however, the transition between strata may be more gradual than shown. Conditions may vary at locations away from or between the borings.

Soil Laboratory Data

Selected samples were subjected to laboratory classification tests to aid in assessment of the on-site soils. Moisture content tests were performed on most of the collected samples. Results of these tests are included on the boring logs and laboratory summary. Atterberg limits and grain size distribution tests were performed to evaluate the general characteristics of the soils and to confirm visual classifications. The results of these laboratory tests are presented on the laboratory summary and boring logs appended to this report. Results of the laboratory index tests are summarized in the following table.

Summary of Laboratory Test Results

Boring Number	Sample Depth (ft)	Liquid Limit	Plasticity Index	Soil Moisture Content (%)	% Passing No. 200	Soil Description	USCS Classification
B-02	1 - 2.5	23	12	20.1	52	Sandy Lean Clay	CL
B-04	3.5 - 5	38	17	18.3	53	Sandy Lean Clay	CL
B-06	8.5 - 10	32	9	9.4	20	Clayey Sand with Gravel	SC
B-09	1 - 2.5	24	11	13.7	52	Sandy Lean Clay	CL



Recommendations

Stripping and Demolition. Demolition debris should be completely removed from the site. Voids resulting from utility and foundation demolition should be properly backfilled with compacted fill. During grading, topsoil and asphalt will need to be stripped from the planned development areas. Organic-laden strippings should be removed from the site or disposed of at designated on-site areas located outside limits of current or future development. Strippings may be stockpiled for re-use as topsoil during landscaping if they are suitable for that purpose. The debris encountered in boring B-02 should be removed from the site during stripping. It is possible that debris to be removed may be encountered in other areas than what was observed in boring B-02.

Proofrolling. The construction areas should be evaluated after stripping and initial cutting, but prior to fill placement, by means of proofrolling. Proofrolling should be performed by having a partially loaded (minimum 20 tons) tandem-axle dump truck progress slowly (at a walking pace) in overlapping passes across the construction site. The subgrade should be relatively smooth and free of wheel ruts, sheepsfoot roller dimples, loose clods of soil, or loose gravel, and the subgrade should not be desiccated, cracked, wet, or frozen. Areas that appear to pump or rut under the proofrolling load should be treated as recommended by the TTL engineering technician. In areas where proofrolling is not practical, the TTL engineering technician should assess the subgrade by probing and/or performing penetrometer tests.

Subgrade Stabilization. Based on the soil conditions at the time of the geotechnical exploration, near surface low consistency soils were observed in the upper 3 feet in borings B-02, B-03, B-04, B-06, B-07, B-08, B-09, and B-10. Therefore, undercutting or scarification and recompaction should be expected to be necessary to provide a stable subgrade. Undercutting 3 feet in the area of the gymnasium and concession stand should be anticipated; however, scarification and recompaction can be attempted for the ticket booths and sidewalks. This may be revealed by proofrolling. Undercutting depends on final grades and where low consistency/wet or otherwise unsuitable soils are indicated by proofrolling. Actual undercut depths are to be based on proofrolling witnessed by TTL's engineering technician once grading is completed. Construction during the typical drier weather of summer and fall (generally May through October) may reveal less undercutting, but the project team should also be prepared for undercutting and replacement quantities to be greater (i.e. scarification and recompaction may not provide a suitable subgrade and require undercutting and replacement) if site grading is to occur during the typical wet weather season (generally November through April).

Compacted Fill. Compacted fill material from an on-site or off-site borrow source should be tested and approved by TTL prior to delivery to the site. On-site soils can be re-used as compacted fill. Off-site borrow material should consist of sandy lean clay, or clayey sand soils exhibiting a USCS soil classification CL or SC, a LL (liquid limit) less than 50, a PI (plasticity index) of 8 to 30, and a minimum of 30% passing the No. 200 sieve. Fill material should be compacted to at least 98% of the soil's maximum density and be within ± 3 percent of the soil's optimum moisture content based on ASTM D698.

Retaining Wall. We understand that a stem wall may be needed along the east side of the gymnasium due to approximately 2 feet of fill in this area. The proposed wall will be approximately 2 feet tall. Lateral earth pressures were estimated for granular backfill material and for the in-situ soils that were encountered at the site. The coefficients presented below do not include a factor of safety of

load/resistance factor. The appropriate factors should be applied based on the application in which the coefficients are being used. The recommended parameters are shown below:

Lateral Earth Pressure Parameters

Parameter	Compacted Fill Soils	Crushed Stone (#57 or #67)
Friction Angle (Φ), degrees	24	38
Moist Unit Weight (γ), pounds per cubic foot	115	105
Active Earth Coefficient (K_a)	0.42	0.24
Passive Earth Coefficient (K_p)	2.3	4.20
At-rest Earth Coefficient (K_0)	0.59	0.38

The parameters above are based on the following recommendations:

- Use the at-rest earth pressure condition if the top of the wall is restrained against rotation or if rotation of the wall is not desired.
- Use the active earth pressure condition if the wall is free to rotate outward at least 1 percent of the height of the wall.
- The earth pressure values are based on the material located within the wedge of soils at an approximate 1H:1V slope from the base of the wall towards the surface.
- Passive conditions are applicable to structures that are cast against the resisting soil and which mobilize sufficient deflection to reach the full passive pressure. We note the amount of movement required to reach the full passive pressure is not acceptable for most structures; therefore, we recommend dividing the passive pressure coefficient by a safety factor of 2 or more.
- The sliding resistance can be calculated using a friction coefficient of 0.35 for footings bearing on soil and 0.5 for footings bearing on 12 inches or more of compacted crushed stone.
- A drain is recommended for collection and removal of surface water percolation or subsurface water along the base of retaining walls. In general, drains should consist of at least a 2-foot-wide section of free-draining gravel immediately behind walls. The free-draining material should be wrapped in a geotextile filter fabric to retard movement of fine-grained clay materials into the open space between the individual grains of the free draining backfill. If crushed stone is used as backfill within the 1H:1V wedge, then the filter fabric should be placed on the interface between the crushed stone and cut slope in soil. A slotted or perforated PVC pipe should be situated at the base of the 2-foot section and be sloped to drain to a sump or other appropriate outlet, such as weep holes.
- The recommended lateral earth pressure coefficients only apply to a level ground surface behind the wall and do not include surcharge loads, earthquake forces, or hydrostatic pressures.
- Only light hand-guided compactors should be allowed to operate within 5 feet of below-grade walls to avoid introducing additional lateral earth pressures from construction equipment.



Foundations and Slabs-on-grade. Once footings have been excavated, the subgrade should be evaluated by DCP testing or manual probing prior to the placement of steel and concrete. If low consistency soils (such as in the upper 3 feet in the borings), are encountered by DCP testing or manual probing, the footings should be overexcavated to an estimated 2 feet below planned bearing elevation then backfilled with compacted fill, lean concrete, or structural concrete to bearing elevation.

The proposed gymnasium, concession stand, and ticket booths can be supported on typical shallow footings bearing in stable native soils or compacted fill. Spread foundations or slabs with turndown footings can be designed using a net allowable bearing pressure of up to 2,500 psf with a minimum bearing depth of 2 feet below finish grade for a total estimated post-construction settlement of 1-inch or less.

Concrete slab-on-grade floors should be placed on a granular fill layer. A typical plastic vapor barrier should be placed beneath interior floor slabs. A modulus of subgrade reaction, k , of 100 pci may be used for design for floor slabs supported on 4 inches of granular fill. ALDOT 825 A or B or 8910 stone should be utilized for the granular fill drainage layer.

Limitations

TTL understands that this Geotechnical Report will be used by Ward Scott Morris Architecture (Client) and various designers and contractors involved with the design and construction of the project. TTL should be invited to attend project meetings (in person or teleconferencing) or be contacted in writing to address applicable issues relating to the geotechnical engineering aspects of the project. TTL should also be retained to review the final construction plans and specifications to evaluate if the information and recommendations in this Geotechnical Report have been properly interpreted and implemented in the design and specifications. This report has not been prepared as, and should not be used as, a design or specification document to be directly implemented by the contractor. The contractor and applicable subcontractors should familiarize themselves with this report prior to the start of their construction activities, contact TTL for any interpretation or clarification of the report, retain the services of their own consultants to interpret this report, or perform additional geotechnical testing prior to bidding and construction.

This Geotechnical Report is based upon the information provided to us by the Client and various other individuals and professionals associated with the project, exploratory borings drilled within the project limits, laboratory testing of randomly selected soil samples recovered during drilling of the exploratory borings, and our engineering analyses and evaluation. The Client and readers of this Geotechnical Report should realize that subsurface variations and anomalies can, and may exist across the site and between the exploratory boring locations. The Client and readers should realize that site conditions can change due to the modifying effects of seasonal and climatic conditions and conditions at times after the exploration may be different than reported herein.

This Geotechnical Report has been prepared for the exclusive use of our Client for specific application to this project. This Geotechnical Report has been prepared in accordance with generally accepted geotechnical engineering practices using that level of care and skill ordinarily exercised by licensed members of the engineering profession currently practicing under similar conditions in the same locale. No warranties, express or implied, are intended or made.

Should the nature, design, or location of the project, as outlined in and addressed by this Geotechnical Report, be modified, the geotechnical engineering recommendations and guidelines provided in this

document will not be considered valid unless TTL is authorized to review the changes and either verifies or modifies the applicable project changes in writing.

Additional information about the use and limitations of a Geotechnical Report is provided within the Geoprofessional Business Association document included at the end of this report.

Closing

We appreciate the opportunity to provide professional geotechnical services for this project and look forward to continuing with construction materials testing services as the project moves forward.

Sincerely,

TTL, Inc.



Austin T. Howard, EI
Project Professional



Brian E. Wysock, PE
Project Engineer

Appendix:

- GBA Information*
- Site Location Map*
- Exploration Location Plan*
- Legend Sheets (Soil)*
- Boring Logs*
- Laboratory Test Data*
- Procedures For Exploration and Laboratory Testing*

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

NOTES:
 1. EXPLORATION LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE.
 2. EXPLORATION LOCATION SYMBOLS ONLY REPRESENT THE LOCATION AND DO NOT REPRESENT THE SIZE OR SHAPE OF THE ACTUAL EXPLORATION METHOD.



Service Layer Credits: Roads: © OpenStreetMap contributors
 Waterbodies and Areas: Source: USGS, Esri
 Waterbodies and Areas:
 TTL Community:
 Sinks: Source: USGS, Esri
 Boring:
 Structures:
 Flowlines: Source: USGS, Esri
 Flowlines:

LEGEND

 Soil Boring

0 150
 Feet



EXPLORATION LOCATION PLAN
 VERBENA HIGH SCHOOL GYMNASIUM AND ATHLETIC IMPROVEMENTS
 WARD SCOTT MORRIS ARCHITECTURE
 VERBENA, CHILTON COUNTY, ALABAMA

DRAWN BY: KL
CHECKED BY: AH
DRAWING DATE: 7/18/2025
REVISION DATE: N/A
PROJECT #: 000250101196.00
SCALE: 1 in = 150 Ft

SOIL LEGEND

FINE- AND COARSE-GRAINED SOIL INFORMATION

FINE-GRAINED SOILS (SILTS AND CLAYS)			COARSE-GRAINED SOILS (SANDS AND GRAVELS)		PARTICLE SIZE	
SPT N-Value	Consistency	Estimated Q_u (TSF)	SPT N-Value	Relative Density	Name	Size (US Std. Sieve)
0 - 1	Very Soft	0 - 0.25	0 - 4	Very Loose	Boulders	>300 mm (>12 in.)
2 - 4	Soft	0.25 - 0.5	5 - 10	Loose	Cobbles	75 mm to 300 mm (3 - 12 in.)
5 - 8	Firm	0.5 - 1.0	11 - 30	Medium Dense	Coarse Gravel	19 mm to 75 mm (3/4 - 3 in.)
9 - 15	Stiff	1.0 - 2.0	31 - 50	Dense	Fine Gravel	4.75 mm to 19 mm (#4 - 3/4 in.)
16 - 30	Very Stiff	2.0 - 4.0	51+	Very Dense	Coarse Sand	2 mm to 4.75 mm (#10 - #4)
31+	Hard	4.0+			Medium Sand	0.425 mm to 2 mm (#40 - #10)
					Fine Sand	0.075 mm to 0.425 mm (#200 - #40)
					Silts and Clays	< 0.075 mm (< #200)

Q_u = Unconfined Compression Strength

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF CLAYS AND SILTS	
Descriptive Terms	Percent of Dry Weight	Descriptive Terms	Percent of Dry Weight
"Trace"	< 15	"Trace"	< 5
"With"	15 - 30	"With"	5 - 12
Modifier	> 30	Modifier	> 12

CRITERIA FOR DESCRIBING MOISTURE CONDITION		CRITERIA FOR DESCRIBING CEMENTATION	
Description	Criteria	Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch	Weak	Crumbles or breaks with handling or little finger pressure
Moist	Damp, but no visible water	Moderate	Crumbles or breaks with considerable finger pressure
Wet	Visible free water, usually soil is below water table	Strong	Will not crumble or break with finger pressure

CRITERIA FOR DESCRIBING STRUCTURE	
Description	Criteria
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick; note the thickness
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick; note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

ABBREVIATIONS AND ACRONYMS			
WOH	Weight of Hammer	N-Value	Sum of the blows for last two 6-in increments of SPT
WOR	Weight of Rod		
Ref.	Refusal	NA	Not Applicable or Not Available
ATD	At Time of Drilling	OD	Outside Diameter
DCP	Dynamic Cone Penetrometer	PPV	Pocket Penetrometer Value
Elev.	Elevation	SFA	Solid Flight Auger
ft.	feet	SH	Shelby Tube Sampler
HSA	Hollow Stem Auger	SS	Split-Spoon Sampler
ID	Inside Diameter	SPT	Standard Penetration Test
in.	inches	USCS	Unified Soil Classification System
lbs	pounds		

SAMPLERS AND DRILLING METHODS	
	AUGER CUTTINGS
	BAG/BULK SAMPLE
	GRAB SAMPLE
	CONTINUOUS SAMPLES
	SHELBY TUBE SAMPLE
	PITCHER SAMPLE
	STANDARD PENETRATION SPLIT-SPOON SAMPLE
	SPLIT-SPOON SAMPLE WITH NO RECOVERY
	DYNAMIC CONE PENETROMETER
	ROCK CORE
WATER LEVEL SYMBOLS	
	WATER LEVEL AT TIME OF DRILLING
	PERCHED WATER OBSERVED AT DRILLING
	DELAYED WATER LEVEL OBSERVATION
	CAVE-IN DEPTH
	OBSERVED SEEPAGE



UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

GRAVELS (>50% of coarse fraction is larger than the #4 sieve)		SANDS (>50% of coarse fraction is smaller than the #4 sieve)		FINE GRAINED SOILS (>50% of material is smaller than the #200 sieve)	
GRAVELS (>50% of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu > 4 Cc = 1-3	GW	Well-graded gravels, gravel-sand mixtures with trace or no fines	
		Cu ≤ 4 and/or Cc < 1 Cc > 3	GP	Poorly-graded gravels, gravel-sand mixtures with trace or no fines	
	GRAVEL WITH 5% TO 12% FINES	Cu > 4 Cc = 1-3	GW-GM	Well-graded gravels, gravel-sand mixtures with silt fines	
			GW-GC	Well-graded gravels, gravel-sand mixtures with clay fines	
		Cu ≤ 4 and/or Cc < 1 Cc > 3	GP-GM	Poorly-graded gravels, gravel-sand mixtures with silt fines	
			GP-GC	Poorly-graded gravels, gravel-sand mixtures with clay fines	
	GRAVEL WITH MORE THAN 12% FINES	GM		Silty gravels, gravel-silt-sand mixtures	
		GC		Clayey gravels, gravel-sand-clay mixtures	
		GC-GM		Clayey gravels, gravel-sand-clay-silt mixtures	
		SW		Well-graded sands, sand-gravel mixtures with trace or no fines	
SANDS (>50% of coarse fraction is smaller than the #4 sieve)	CLEAN SAND WITH <5% FINES	Cu > 6 Cc = 1-3	SP	Poorly-graded sands, sand-gravel mixtures with trace or no fines	
		Cu ≤ 6 and/or Cc < 1 Cc > 3	SW	Well-graded sands, sand-gravel mixtures with trace or no fines	
	SAND WITH 5% TO 12% FINES	Cu > 6 Cc = 1-3	SW-SM	Well-graded sands, sand-gravel mixtures with silt fines	
			SW-SC	Well-graded sands, sand-gravel mixtures with clay fines	
		Cu ≤ 6 and/or Cc < 1 Cc > 3	SP-SM	Poorly-graded sands, sand-gravel mixtures with silt fines	
			SP-SC	Poorly-graded sands, sand-gravel mixtures with clay fines	
	SAND WITH MORE THAN 12% FINES	SM		Silty sands, sand-gravel-silt mixtures	
		SC		Clayey sands, sand-gravel-clay mixtures	
		SC-SM		Clayey sands, sand-gravel-clay-silt mixtures	
	FINE GRAINED SOILS (>50% of material is smaller than the #200 sieve)	SILTS & CLAYS (Liquid Limit less than 50)	ML		Inorganic silts with low plasticity
CL			Inorganic clays of low plasticity, gravelly or sandy clays, silty clays, lean clays		
CL-ML			Inorganic clay-silts of low plasticity, gravelly clays, sandy clays, silty clays, lean clays		
OL			Organic silts and organic silty clays of low plasticity		
SILTS & CLAYS (Liquid Limit more than 50)		MH		Inorganic silts of high plasticity, elastic silts	
		OH		Organic clays and organic silts of high plasticity	

USCS - HIGHLY ORGANIC SOILS

Primarily organic matter, dark in color, organic odor



PT

Peat, humus, swamp soils with high organic contents

OTHER MATERIALS



BITUMINOUS CONCRETE (ASPHALT)

CONCRETE

CRUSHED STONE/AGGREGATE BASE

TOPSOIL

FILL

UNDIFFERENTIATED ALLUVIUM

UNDIFFERENTIATED OVERBURDEN

BOULDERS AND COBBLES

UNIFORMITY COEFFICIENT

$$C_u = D_{60}/D_{10}$$

COEFFICIENT OF CURVATURE

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

Where:

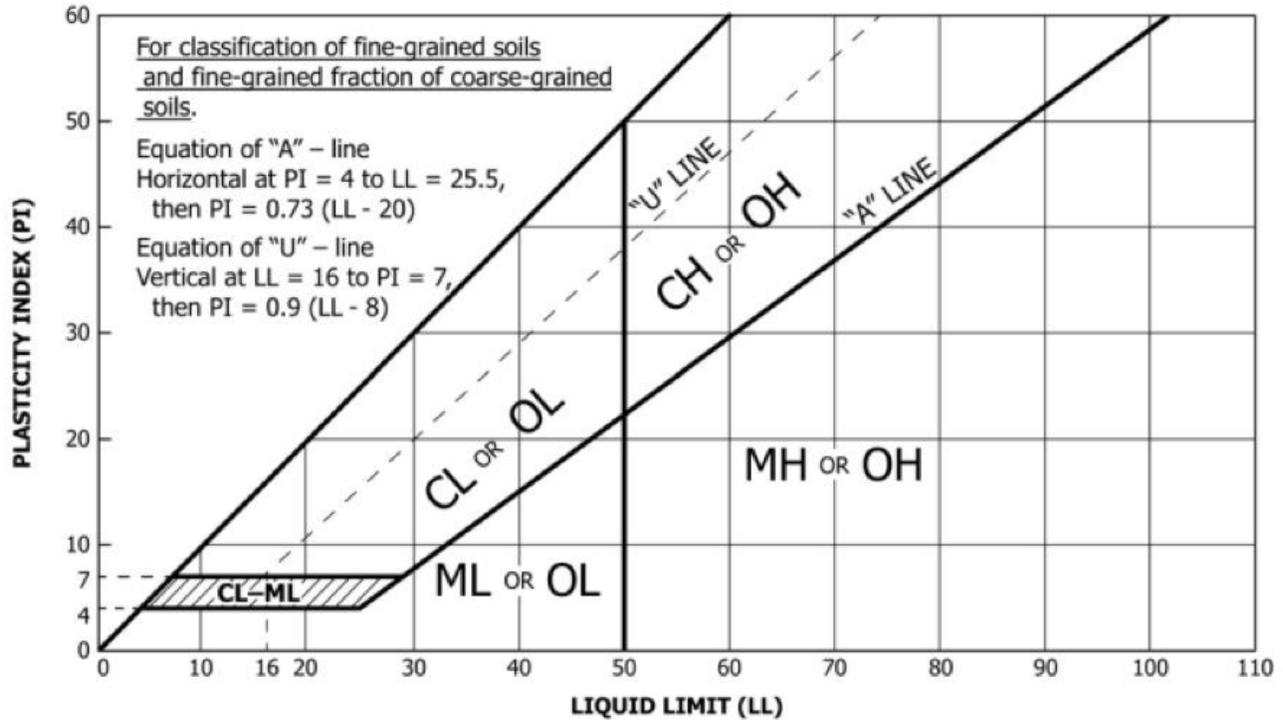
D_{60} = grain diameter at 60% passing

D_{30} = grain diameter at 30% passing

D_{10} = grain diameter at 10% passing



PLASTICITY CHART FOR USCS CLASSIFICATION OF FINE-GRAINED SOILS



IMPORTANT NOTES ON TEST BORING RECORDS

- 1) The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- 2) Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown. Solid lines are used to indicate a change in the material type, particularly a change in the USCS classification. Dashed lines are used to separate two materials that have the same material type, but that differ with respect to two or more other characteristics (e.g. color, consistency).
- 3) No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- 4) Logs represent general soil and rock conditions observed at the point of exploration on the date indicated.
- 5) In general, Unified Soil Classification System (USCS) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- 6) Fine-grained soils that plot within the hatched area on the Plasticity Chart, and coarse-grained soils with between 5% and 12% passing the #200 sieve require dual USCS symbols as presented on the previous page.
- 7) If the sampler is not able to be driven at least 6 inches, then 50/X" indicates that the sampler advanced X inches when struck 50 times with a 140-pound hammer falling 30 inches.
- 8) If the sampler is driven at least 6 inches, but cannot be driven either of the subsequent two 6-inch increments, then either 50/X" or the sum of the second 6-inch increment plus 50/X" for the third 6-inch increment will be indicated.
 Example 1: Recorded SPT blow counts are 16 - 50/4", the SPT N-value will be shown as N = 50/4"
 Example 2: Recorded SPT blow counts are 18 - 25 - 50/2", the SPT N-value will be shown as N = 75/8"



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-01

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 5 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 525.5 ft	
Hammer Type: Auto	Coordinates: 32.7489, -86.5076	
Drilling Method: Hollow-stem auger w/SPT sampling	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples					Lab					
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
525			TOPSOIL (7 INCHES) 0.6											
			COASTAL PLAIN: SANDY LEAN CLAY , firm to very stiff, reddish brown and dark brown, moist (CL)		2-2-6 (8)	94				19.3				
					6-7-9 (16)	100				18.4				
	5		5.0											

Boring terminated at 5 feet

BoreDM Template: AEP



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-02

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 5 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 523.5 ft	
Hammer Type: Auto	Coordinates: 32.7489, -86.5073	
Drilling Method: Hollow-stem auger w/SPT sampling	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples					Lab					
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
			TOPSOIL (12 INCHES), with debris (brick, glass, metal scrap)											
	1.0		POSSIBLE FILL: SANDY LEAN CLAY, very soft, reddish brown, moist (CL)		WOH-WOH-1 (1)	100				20.1	23-11-12	52		
	3.0													
520			COASTAL PLAIN: SANDY LEAN CLAY, very stiff, reddish brown and dark brown, moist (CL)		3-6-10 (16)	100				20.6				
	5.0													

Boring terminated at 5 feet



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-03

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 15 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 526 ft	
Hammer Type: Auto	Coordinates: 32.7487, -86.5076	
Drilling Method: Solid-Flight Auger	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples				Lab						
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
525			TOPSOIL (4 INCHES) 0.3											
			COASTAL PLAIN: SANDY LEAN CLAY, firm to stiff, reddish brown, moist (CL)		1-2-3 (5)	44				18.5				
	5				3-5-8 (13)	83				20.2				
520			CLAYEY SAND, medium grained, medium dense, reddish brown, moist (SC) 5.5		5-8-9 (17)	100				20.2				
	10				7-8-9 (17)	100				20.2				
515			CLAYEY SAND, dense, reddish brown and light brown, with rounded gravel, moist (SC) 12.0		15-21-24 (45)	100				15.8				
	15		Boring terminated at 15 feet 15.0											

BoredM Template: AEP

This record shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-04

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 15 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 525 ft	
Hammer Type: Auto	Coordinates: 32.7486, -86.5073	
Drilling Method: Hollow-stem auger w/SPT sampling	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples				Lab						
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
			TOPSOIL (2 INCHES) 0.2											
			COASTAL PLAIN: SANDY LEAN CLAY, firm, reddish brown and dark brown, moist (CL)	X	2-2-3 (5)	100				18.2				
			SANDY LEAN CLAY, very stiff, dark reddish brown, moist (CL) 3.0											
				X	7-10-12 (22)	100				18.3	38-22-17	53		
520	5													
			CLAYEY SAND, medium grained, medium dense and dense, reddish brown, with trace rounded gravel, moist (SC) 6.0											
				X	6-11-13 (24)	100				16.0				
				X	9-19-22 (41)	100				13.1				
515	10													
				X	9-11-12 (23)	83				13.8				
510	15		Boring terminated at 15 feet 15.0											

BoreDM Template: AEP

This record shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-05

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 10 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 529 ft	
Hammer Type: Auto	Coordinates: 32.7486, -86.5081	
Drilling Method: Solid-Flight Auger	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples				Lab					
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)
			CRUSHED AGGREGATE (2 INCHES) 0.2	X	1-2-5 (7)	83				15.1			
			SANDY LEAN CLAY, firm, reddish brown, moist (CL) 3.0										
525	5		SANDY LEAN CLAY, very stiff to hard, reddish brown and light brown, with trace rounded gravel, moist (CL)	X	8-10-12 (22)	100				17.2			
				X	9-13-14 (27)	100				18.2			
520				X	10-17-22 (39)	100				11.3			
	10												

Boring terminated at 10 feet

BoreDM Template: AEP



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-06

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 15 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 529 ft	
Hammer Type: Auto	Coordinates: 32.7477, -86.5083	
Drilling Method: Solid-Flight Auger	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples					Lab					
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
			TOPSOIL (4 INCHES) 0.3											
			COASTAL PLAIN: SANDY LEAN CLAY, firm to very stiff, reddish brown and dark brown, with trace rounded gravel, moist (CL)	X	2-2-3 (5)	83				14.5				
525	5			X	4-8-10 (18)	100				17.2				
				X	8-11-14 (25)	100				18.2				
520	10		CLAYEY SAND with GRAVEL, medium grained, dense and medium dense, reddish brown and light brown, moist (SC) 8.0	X	21-22-19 (41)	100				9.4	32-23-9	20		
				X	10-11-12 (23)	100				10.4				
515	15		Boring terminated at 15 feet 15.0											

BoreDM Template: AEP



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-07

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 15 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 529 ft	
Hammer Type: Auto	Coordinates: 32.7476, -86.5081	
Drilling Method: Solid-Flight Auger	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples				Lab						
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
			TOPSOIL (5 INCHES) 0.4											
			COASTAL PLAIN: SANDY LEAN CLAY, soft, reddish brown, with trace rounded gravel, moist (CL)	X	2-1-2 (3)	83				18.5				
			SANDY LEAN CLAY, very stiff, reddish brown, with trace rounded gravel, moist (CL) 3.0											
525	5			X	5-8-9 (17)	100				18.6				
				X	6-7-9 (16)	100				16.3				
520	10		CLAYEY SAND, medium grained, dense and medium dense, reddish brown and light brown, with trace rounded gravel, moist (SC) 8.0	X	11-17-28 (45)	100				13.8				
515	15			X	9-14-12 (26)	100				14.5				

Boring terminated at 15 feet

BoreDM Template: AEP



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring B-08

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings and patched with cold asphalt mix upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 10 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 532 ft	
Hammer Type: Auto	Coordinates: 32.7473, -86.5090	
Drilling Method: Solid-Flight Auger	<input type="checkbox"/> Water Level At Time Of Drilling N.E. <input type="checkbox"/> Cave In N/A	<input checked="" type="checkbox"/> Delayed Water Level N/A <input type="checkbox"/> Delayed Water Date N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples				Lab						
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
			ASPHALT (6 INCHES) 0.5											
			CRUSHED AGGREGATE (2 INCHES) 0.7											
530			COASTAL PLAIN: SANDY LEAN CLAY, firm, reddish brown and dark brown, trace gravel, moist (CL)	X	2-2-4 (6)	78				14.0				
			SANDY LEAN CLAY, very stiff, reddish brown and light brown, moist (CL) 3.0											
	5			X	5-10-10 (20)	100				16.4				
525				X	5-6-12 (18)	100				18.0				
				X	10-10-13 (23)	100				16.5				
	10													

Boring terminated at 10 feet

BoreDM Template: AEP

This record shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring B-09

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 5 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 531 ft	
Hammer Type: Auto	Coordinates: 32.7485, -86.5087	
Drilling Method: Hollow-stem auger w/SPT sampling	Water Level At Time Of Drilling: N.E.	Delayed Water Level: N/A
	Cave In: N/A	Delayed Water Date: N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples					Lab				
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)
530			CRUSHED AGGREGATE (2 INCHES) 0.2										
			ASPHALT (1 INCH) 0.3										
			COASTAL PLAIN: SANDY LEAN CLAY, soft, reddish brown and dark brown, trace rounded gravel, moist (CL) 3.0	X	2-1-3 (4)	94				13.7	24-13-11	52	
			SANDY LEAN CLAY, very stiff, reddish brown and light brown, moist (CL) 5.0	X	8-8-15 (23)	100				18.2			

Boring terminated at 5 feet



Verbena High School Gymnasium and Athletic Improvements
Ward Scott Morris Architecture
Verbena, Chilton County, Alabama

Log of Soil Boring
B-10

Drilling Co.: TTL, Inc.	Project Number: 000250101196.00	Remarks: The boring was backfilled with soil auger cuttings upon completion. Boring elevations were estimated from topographic survey and should be considered approximate.
Driller: Richard Sanders	Date Drilled: 06/04/2025	
Logged By: Austin Peinhardt	Boring Depth: 5 ft	
Equipment: Geoprobe 7822DT	Boring Elevation: 531 ft	
Hammer Type: Auto	Coordinates: 32.7473, -86.5086	
Drilling Method: Solid-Flight Auger	<input type="checkbox"/> Water Level At Time Of Drilling N.E. Cave In N/A	<input checked="" type="checkbox"/> Delayed Water Level N/A Delayed Water Date N/A

Elevation (feet)	Depth (feet)	Graphic Log	Materials Description	Samples					Lab					
				Sample Graphic	Blow Counts (N/Refusal)	Recovery (%)	RQD (%)	Pocket Penetrometer (tsf)	Moisture Content (%)	Atterberg Limits (LL-PL-Pi)	% Fines	Dry Density (pcf)	Compressive Strength (ksf)	
530			CRUSHED AGGREGATE (1 INCH) 0.1 TOPSOIL (12 INCHES) 1.1											
			COASTAL PLAIN: SANDY LEAN CLAY, soft to stiff, reddish brown and brown, moist (CL)		1-1-2 (3)	100				16.5				
					4-5-8 (13)	100				18.7				
	5													

Boring terminated at 5 feet

BoreDM Template: AEP



Laboratory Results Summary

PROJECT Verbena High School Gymnasium and Athletic Improvements **PROJECT NO.** 000250101196.00

CLIENT Ward Scott Morris Architecture

LOCATION Verbena, Chilton County, Alabama

Boring ID	Depth (ft)	Moisture Content (%)	LL	PL	PI	%Gravel	% Sand	% Fines	Dry Density (PCF)	USCS	AASHTO Group
B-01	1	19.3									
B-01	3.5	18.4									
B-02	1	20.1	23	11	12	1	47	52		CL	A-6
B-02	3.5	20.6									
B-03	1	18.5									
B-03	3.5	20.2									
B-03	6	20.2									
B-03	8.5	20.2									
B-03	13.5	15.8									
B-04	1	18.2									
B-04	3.5	18.3	38	22	17	1	46	53		CL	A-6
B-04	6	16.0									
B-04	8.5	13.1									
B-04	13.5	13.8									
B-05	1	15.1									
B-05	3.5	17.2									
B-05	6	18.2									
B-05	8.5	11.3									
B-06	1	14.5									
B-06	3.5	17.2									
B-06	6	18.2									
B-06	8.5	9.4	32	23	9	23	57	20		SC	A-2-4
B-06	13.5	10.4									
B-07	1	18.5									
B-07	3.5	18.6									
B-07	6	16.3									
B-07	8.5	13.8									
B-07	13.5	14.5									
B-08	1	14.0									
B-08	3.5	16.4									
B-08	6	18.0									
B-08	8.5	16.5									
B-09	1	13.7	24	13	11	1	47	52		CL	A-6
B-09	3.5	18.2									
B-10	1	16.5									
B-10	3.5	18.7									

EXPLORATION PROCEDURES

Field Locating of Borings

Exploratory borings were located in the field using a hand-held, sub-meter, global positioning system (GPS) device and should be considered approximate. The Exploration Location Plan in the appendix depicts the approximate locations of the borings. Surveying of borehole locations was not in the scope of services.

Soil Borings

The soil borings were advanced by a track-mounted drilling rig (Geoprobe) using conventional solid stem and hollow-stem auger drilling methods. Soil samples were obtained at selected depths in general accordance with the Standard Penetration Test (SPT) as described in ASTM D1586. For this test, a split-barrel sampler is driven into the soil through three increments of 6 inches with blows from a 140-pound hammer falling 30 inches. The number of hammer blows required to advance the split-barrel sampler through each increment is recorded, and the sum of the blow counts for the final two 6-inch increments is called the “N-value,” with units of blows per foot (bpf). The N-values recorded during the sampling process provide an index to the strength and compressibility of the soil.

A TTL geoprofessional was present during drilling to document conditions and classify the recovered samples in general accordance with the Unified Soil Classification System (USCS), which is defined by ASTM D2487 and D2488. The geoprofessional maintained handwritten records (called boring logs) of the drilling, sampling, groundwater, and backfilling data.

Groundwater Measurements

Groundwater was measured at the time of drilling. Water levels were measured to the nearest ½ of a foot. Delayed groundwater measurements were not attempted due to the borings being drilled and backfilled in one day/mobilization.

Backfilling Boreholes

Each borehole was backfilled to the ground surface with soil auger cuttings and patched with cold patch asphalt, if necessary. Backfill sometimes consolidates causing the top of the backfill column to settle and leaving an open hole at the ground surface. Return trips to the site to top-off backfill that has settled were not part of our scope of services.

Laboratory Testing Procedures

Classification and Index Testing

Selected split-barrel samples were tested for the following properties in general accordance with the applicable ASTM standards:

- Moisture content (ASTM D2216)
- Atterberg limits (ASTM D4318)
- Sieve analysis (ASTM D422)

Results of tests for moisture content, Atterberg limits, and percent passing No. 200 sieve are presented on individual boring logs and laboratory summary sheet in the appendix.

SECTION 312200 - EARTHWORK

PART 1 - GENERAL

1.1 Related Documents:

- A. Drawings and general provisions of the Contract including General, Supplemental, and Special Conditions.
- B. Geotechnical Report.

1.2 Summary:

- A. This specification section covers stripping, excavation, borrow, fill placement, undercutting, and other items incidental to earthwork operations required to complete the work.
- B. For purposes of earthwork construction, all soils shall be classified using the Unified Soil Classification System.
- C. The Contractor shall be fully responsible for the disposal of all excess materials resulting from excavation or other earthwork operations.
- D. The Contractor shall be fully responsible for furnishing, delivering, and placing all fill material necessary to achieve the finish grades indicated in the contract documents.
- E. The Contractor shall be fully responsible for location, construction, maintenance, and removal of all haul roads. The Contractor shall be responsible for obtaining all rights-of-way necessary for the completion of the work and not indicated in the Contract Documents.
- F. Specifications for excavation and embankment shall follow the most recent edition of the ALDOT Standard Specifications for Highway Construction.
- G. The Contractor shall be responsible for the prevention of erosion, runoff control, and for the protection of existing streams. Hay bales, silt fencing, and sheeting exposed areas shall be utilized to minimize sediment transport from cut areas, temporary spoil piles, and other exposed areas.
- H. The Contractor is responsible for obtaining stormwater and runoff permits, if required.
- I. Where excavations are made adjacent to existing buildings, other structures or utilities or in paved streets or alleys, the Contractor shall take particular care to sheet, shore and brace the sides of the excavation adequately so as to prevent any undermining of or settlement beneath such structures, utilities or pavements. Where necessary, the Contractor shall be responsible for underpinning or bracing existing structures, utilities or pavement to prevent settlement or other damage. Where necessary, the Contractor shall be responsible for temporarily relocating existing utilities. All such relocations shall be coordinated with the Owner of the utility.
- J. Sheeting, shoring, and bracing materials shall not be left in place unless shown in the contract documents or approved in writing by the Engineer. Such materials shall be removed in such manner as to protect the work, workmen, the Owner's facilities, adjacent property and the general public.
- K. The Contractor shall take all due precautions for the safety of the work, the workmen, the Owner's facilities and the general public.
- L. The Contractor shall comply with federal, state, and local ordinances, laws, guidelines and regulations related to earthwork and excavation.
- M. In all cases, where materials are deposited around open excavations, they shall be placed so that, in the event of rain, no damage will result to the work or adjacent property.

1.3 Submittals:

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

1.4 Quality Assurance:

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

1.5 Definitions:

- A. Common Excavation:
 - 1. Common excavation shall be defined as the excavation of all material that can be excavated, transported and unloaded by the use of heavy ripping equipment and wheel tractor scrapers with push tractors or that can be excavated and dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard and equipped with attachments (shovel, bucket, backhoe, dragline, clam shell, rock teeth, etc.) appropriate to the character of the materials and the site conditions.
 - 2. The presence of isolated boulders or rock fragments larger than one cubic yard in size will not in itself be sufficient cause to change the classification of the surrounding material.
- B. Removal of Unsuitable Material:
 - 1. Unsuitable Material shall be defined as material not suitable for structural placement. Unsuitable Material shall include, but not limited to, excavation containing topsoil, muck, stumps, concrete, and other debris. The Engineer's determination of what is unsuitable material shall be final.
- C. Off-Site Borrow - Select:
 - 1. The Contractor is responsible for the stockpiling of select earth fill, available on site, such that it is not mixed with undesirable materials. The Contractor is further responsible for transporting select earth fill as required for utilization in areas indicated in the Contract Documents. Failure to stockpile and transport select earth fill shall not entitle the Contractor to additional compensation.
 - 2. The Contractor shall provide acceptable material from off site.

PART 2 - PRODUCTS**2.1 General: OMIT**

PART 3 - EXECUTION

3.1 General:

- A. The Contractor is solely responsible for the means and methods required to perform the excavation, site grading, and backfill operations required to complete the work. No portion of the plans and/or specifications shall be construed as limiting either the extent of excavation required or the equipment required to affect the work.

3.2 Safety:

- A. The Contractor shall proceed with the work in a manner to insure the safety of the work, workmen, the general public, adjacent utilities and structures.
- B. Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased if necessary to provide space for sheeting, bracing, shoring, and other supporting installations. The Contractor shall furnish, place and subsequently remove such supporting installations.

3.3 Placement of Fill:

- A. Fill materials shall be as indicated on the drawings or specified elsewhere herein.
- B. All areas to receive fill shall be scarified to a depth of 6" and compacted prior to the placement of any fill material.
- C. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel wheeled rollers or other equipment well suited to the soil being compacted.
- D. Material shall be moistened or aerated as necessary to provide the required moisture content.
- E. Satisfactory material shall be placed in 8" inches loose depth and then compacted.
- F. No material shall be placed on surfaces that are muddy, frozen, or that contain frost.
- G. Sloped surfaces steeper than 4 horizontal to 1 vertical shall be plowed, stepped, benched or broken up as directed by the Engineer.
- H. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 6 inches and recompact before the next layer is placed.
- I. The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of not less than 2 percent shall be maintained to insure effective drainage, and except as otherwise specified for drain fill zones. If the drawings or specifications require or the Engineer directs that fill be placed at a higher level in one part of an embankment than another, the top surface of each part shall be maintained as specified above.
- J. Fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements of removed and replaced by acceptable fill. The replacement fill and the foundation, abutment and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.
- K. Compaction requirements for fill shall be as determined by ASTM D 698, with a moisture content of + or - 3% of optimum, and a minimum Standard Proctor of 98%.

3.4 Stripping:

- A. Unless otherwise shown on the drawings or specified herein:
 - 1. Strip all areas within permanent easements for pipelines.
 - 2. Strip 5-feet outside of edge of pavement or outside edge of gutter, the greater of the two, for roadways.
 - 3. Strip 5-feet outside of building lines or 5-feet beyond the top of slope for structural excavating.
 - 4. The Contractor may strip additional areas within the limits of the construction easements and/or the job site at its option.
- B. Stripping shall be to a depth to remove all topsoil and objectionable materials from the job site.

3.5 Excavation Limits:

- A. Excavation for structures shall be sufficiently large for the proper placing of the forms and concrete and for dewatering purposes but shall not be excessively large in horizontal area.
- B. Excavation beyond the specified lines and grades (over-excavation) shall be backfilled by the Contractor, at its own expense, with a material acceptable to the Engineer.
- C. Excavation for manholes shall not be greater in horizontal area than that required to allow one foot clear between the outer surface of manholes and the wall of the excavation or the sheeting used to protect it.

3.6 Structure Backfill:

- A. Backfilling around foundations or structures shall be promptly accomplished.
- B. Before backfilling newly constructed walls, the Contractor shall allow all concrete sufficient curing time to obtain strength necessary to withstand backfilling.
- C. Selected earth fill shall be used for backfilling, unless otherwise detailed.
- D. No trash shall be allowed to accumulate in the space to be backfilled, and this space shall be well cleared before backfill is placed.
- E. The backfill shall be compacted by mechanical tamping or rolling in layers not over six (6) inches thick and shall be compacted as indicated on the standard details.

END OF SECTION 312200

SECTION 312205 - PREPARATION OF SUBGRADE

PART 1 - GENERAL

1.1 Work Included

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

END OF SECTION 312205

SECTION 312250 - TRENCHING, BACKFILL AND COMPACTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section of Specifications deals with the requirements for Trenching, Backfill, and Compaction for utility lines placed in roadways, lawns or unimproved property or any other area.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Ductile Iron Pipe and Fittings
- B. Gate Valves
- C. Check Valves
- D. Backflow Preventer
- E. Valve Boxes and Vaults
- F. PVC Water Pipe
- G. Fire Hydrants
- H. PVC Pipe for Gravity Sewers
- I. PVC Pipe for Force Main Sewers
- J. Reinforced Concrete Pipe for Storm Sewers

1.3 RELATED SECTIONS

- A. Section 332433 – Storm Sewers
- B. Section 332600 – Ductile Iron Pipe and Fittings
- C. Section 332625 – PVC Water Pipe
- D. Section 332660 – Water System

1.4 REFERENCES

- A. U.S. Department of Labor, Occupational Safety and Health Administration.
- B. State of Alabama Department of Transportation Standard Specifications for Highway Construction.

1.5 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. The Contractor shall maintain all drainage ways, gutters, etc., at all times. The Contractor at his own expense shall remove any eroded or washed material that enters pipes, ditches, or streams.
 - 2. The Contractor shall provide erosion control as required to protect from damage surrounding areas.
 - 3. All areas damaged as a result of erosion shall be repaired to a condition equal or better than the condition prior to construction, as determined by the Owner's Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Select Backfill:
 - 1. Select backfill where specified or required shall be crushed limestone. Crushed stone shall meet or exceed the requirements of the Alabama Department of Transportation Standard Specifications for Highway Construction, Section 801, No. 57 Stone.
- B. Standard Backfill:
 - 1. Standard backfill shall consist of native soils free of large rocks, boulders and other deleterious substances unless otherwise noted on the plans. If stone backfill is to be used in all locations as directed by the Construction Plans, then native soils, etc. shall not be the standard backfill.

C. Bedding:

1. Class "1" Bedding shall be Alabama Department of Transportation Standard Specifications for Highway Construction, Section 801, as follows:
Gravity Pipe (ALL materials) - No. 57 crushed limestone
Pressure Pipe (material NOT PLASTIC) - No. 57 crushed limestone
Pressure Pipe (PLASTIC material) – No. 8910 crushed limestone
*Unless otherwise shown on the utility trench details
2. Class "2" Bedding shall be reinforced concrete 3000 psi design mix.
3. Unless specified on the drawings or required by the Engineer, pipe shall be bedded in native soil (Class "3").

D. Trench Foundation

1. Trench foundation material shall be Alabama Department of Transportation Standard Specifications for Highway Construction, Section 801, No. 57 crushed limestone, unless otherwise directed by the Owner's Representative. This material shall only be used when approved in advance by the Owner's Representative.

2.2 SOURCE QUALITY CONTROL

- A. The Contractor shall supply gradation analysis for each type of crushed stone used.

PART 3 - EXECUTION**3.1 EXAMINATION OF CONDITIONS**

- A. The Contractor shall examine the area to be trenched and verify his requirements for trenching.

3.2 PROTECTION AND REMOVALS

A. Fences:

1. All fences in conflict with the proposed construction shall be removed in a neat and workmanlike manner and then replaced immediately following construction operations. Where materials removed are not suitable for reuse, they shall be replaced with new material of equal or better quality and construction. All fences shall be rebuilt to line, with posts well set, wires fastened with new staples or ties and well stretched. All corner and end posts shall be well braced and set a minimum of 30 inches in the ground.

B. Utility Poles, Guy Wires, Miscellaneous Poles, Etc.:

1. All utility poles, guy wires, sign posts and similar private obstructions which are indicated on the plans or existing on the ground shall be removed and replaced by the Contractor at his own expense. In the event street signposts or signs are damaged or destroyed by the Contractor's operations, they may be replaced by the Owner at the Contractor's expense.
2. When it is necessary to remove or adjust any utilities, representatives of the utilities involved shall be notified to decide the method and nature of work to be done. The Contractor shall make satisfactory arrangements with other utilities for the required removal or adjustments at the Contractor's expense, unless otherwise specified.
3. The Contractor shall be held liable for damage, including negligent or willful damage to any other utility and shall pay for the cost of all necessary repairs and any damages resulting to public or private property resulting there from.
4. The Contractor shall take whatever means necessary to support sewer mains to their true line and grade when they are encountered during excavation. The pipe shall be supported so that no leakage will occur and under no circumstances will the Contractor be allowed to bypass raw sewage or allow raw sewage to leak into the trench. If a repair becomes necessary the contractor shall use materials of the same type and class of pipe. At a minimum, PVC pipe and fittings shall conform to ASTM D3034, SDR 26. All couplings to existing pipe shall be manufactured couplings and all metal parts shall be stainless steel.

C. Ornamental Shrubs and Trees:

1. Ornamental shrubs and trees shall not be removed unless directed by the Owner's Representative. When ornamental shrubs and/or trees are to be removed and replaced, the following steps shall be followed:
 - a. Remove all trees, shrubs or plants, which interfere with construction intact with root system and protect from drying during construction period.

- b. Replace plant to original location as soon as possible, taking care to insure that hole is large enough, and no damage is done to root system.
 - c. Fill hole with good topsoil and tamp lightly and firmly into place and water plant.
 - 2. Contractor shall replace with like kind and size if any plant, tree, or shrub which is disturbed by construction and dies within 1 year, at no cost to the Owner.
- D. Adjacent Property:
- 1. The Contractor shall confine his operations to the rights-of-ways and/or easements designated. The Contractor at no additional cost to the Owner shall repair any damage to adjacent property.
- E. Private Drives and Sidewalks:
- 1. The Contractor shall keep all private drives and sidewalks open and accessible at all times.
 - 2. All streets and public roads shall be kept open and accessible to emergency vehicles at all times.
- F. Existing Underground Utilities:
- 1. The Contractor shall protect all existing utilities during the trenching operation. The Contractor shall cooperate fully with the utility's requests for temporary and permanent supports during the trenching operation and shall furnish and install supports at no additional cost to the Owner.
 - 2. Storm sewers in conflict with the proposed trench may be carefully dislodged and stockpiled. The pipes shall be cleaned and replaced immediately after new construction is clear. Storm sewers damaged by the Contractor shall be replaced with new pipe at no additional cost to the Owner. All storm sewers removed shall be re-laid to proper grade on a firm bedding so that settlement will not occur.

3.3 TRENCH PREPARATION

- A. Clearing and Grubbing:
- 1. Where clearing or partial clearing of the right-of-way or easements is necessary, such work shall be completed prior to trench excavation. Projecting materials such as trees, logs, brush, hedges, etc., shall be cut as near to the surface of the ground as possible, and all stumps and roots shall be grubbed out unless specifically stated otherwise. All materials so cleared and grubbed shall be removed from the site. In no case shall excavated materials be allowed to cover brush or trees prior to disposal. Clearing and grubbing costs shall be included in the unit price bid for the related pipe unless a specific line item for clearing and grubbing is included in the bid schedule.
 - 2. The Contractor shall bear all costs of disposing of all cleared and grubbed materials. Unless otherwise specified, all merchantable timber cut from the area designated to be cleared shall become the property of the Contractor.
 - 3. Burning will be permitted, provided the Contractor obtains permits and meets the requirements of the proper fire authorities and any other state, county or local ordinances. Burning on private property will not be permitted without written permission of the Owner of the property. The authority to burn shall in no way relieve the Contractor from damages, which may result from his operations.
 - 4. In no case shall any materials from clearing and grubbing operations be left on the project, or be pushed onto abutting private properties, or be buried in embankments or trenches on the project.
 - 5. On public property, existing trees or limbs over 2 inches in diameter shall not be cut unless they are within 7 feet of pipe centerline or specific permission is received from the Engineer. On private easements or in lawns, no trees or brush shall be cleared or cut without prior approval of the Engineer or Inspector. The Contractor shall be required to remove trees, shrubs or plants on private property intact, and to ball the roots, keep watered as required, and replant in their original location upon completion of pipe laying operations, unless written permission is obtained from the Engineer, or unless otherwise specified. The Contractor shall replace, at his own expense, any trees, shrubs, or plants which shall be damaged as a result of his operations, or which shall die within 1 year of the time it was disturbed or damaged.
- B. Saw Cutting:
- 1. Prior to beginning the trenching operation in paved areas such as roads, drives, sidewalks, and parking lots, all paving shall be saw cut through. All paving materials shall be removed and disposed of prior to the trenching operation.
 - 2. Prior to beginning the saw cutting, all traffic control devices, barricades, cones and permits required shall be obtained and in place.
- C. Verification of Existing Utilities:
- 1. Prior to the excavation but after the saw cutting in paved areas, the Contractor shall unearth all known utilities and confirm the location and depth of such utility sufficiently far enough in advance to adjust the vertical or horizontal alignment of the pipeline if necessary.

3.4 TRENCH CONSTRUCTION

- A. General:
1. Trenching or excavation for pipe lines shall consist of the excavation necessary for the installation of sanitary or storm sewers, water lines, gas lines, and other utilities and all appurtenant facilities, including manholes, junction boxes, inlets, outlets, thrust blocks, and pipe protection as called for on the Drawings.
 2. Trench excavation shall be made in an open cut unless tunneling or other construction methods are specifically authorized, and shall be true to the lines and grades shown on the plans or established by the Engineer.
 3. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. However, when trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of one (1) foot above the top of the pipeline.
 4. All streets, sidewalks, crossings, fire hydrants, water valves, fire alarm boxes and other similar public utilities are to be kept open or accessible for their intended use.
 5. Every drain, gutter, culvert, or sewer for surface drainage encountered is to be kept open for both temporary and permanent flow, or if necessarily closed, other adequate provision for drainage is to be made.
 6. In all cases where materials are deposited along open trenches, they shall be placed so that in the event of rain, no damage will result to the work and/or to adjacent property.
 7. Pipe trenches shall not be excavated more than 300 feet in advance of pipe laying and temporary bridges or cross walks shall be constructed where required to maintain vehicular or pedestrian traffic.
 8. Trench widths shall be confined to dedicated rights-of-way or construction easements, unless special written agreements have been made with the affected property owner. Place all excavated materials within easements or rights-of-way, and do not obstruct any public or private roadways or streets.
 9. Where select backfill is specified or required, all excavated materials shall be promptly removed and disposed of by the Contractor.
- B. Rock Excavation:
1. Rock encountered in trench excavation for pipe lines shall be removed for the over-all width of trench and to a depth of 6-inches below the bottom of the barrel of pipe 24-inches in diameter and smaller, and 8-inches below the bottom of pipe 24 to 36 inches in diameter, and 12-inches below pipe larger than 36-inches in diameter, if rock extends to such depths.
 2. Where pipelines are constructed on concrete cradles, rock shall be excavated to the bottom of the cradle as shown on the plans. When necessary to provide sufficient working space, rock shall be excavated to additional depth for bell holes.
 3. After the Engineer has inspected the completed excavation, the space below the ultimate pipe or structure grade shall be filled with an approved foundation material and compacted to the proper grade.
 4. Drilling and blasting methods used in rock excavation shall be optional with the Contractor but shall be conducted with due regard to the safety of persons and property in the vicinity of the work and in strict conformity with all laws, ordinances, or regulations governing blasting and the use of explosives. The Contractor shall be licensed for this type of blasting and shall follow the insurance requirements of the general conditions. The Contractor shall also notify the fire department at least 48 hours in advance of any blasting. (Blasting not allowed)
 5. Rock excavation near existing structures of all types shall be conducted with the utmost care, and every precaution shall be taken to prevent damage to such structures. Any damage or injury of whatever nature to persons or property caused directly or indirectly by blasting operations shall be promptly repaired, replaced, or compensated for by the Contractor at his own expense and to the satisfaction of the persons injured or the owners of the property damaged.
- C. Sheeting, Shoring and Bracing:
1. The sides of all trenching excavations shall be sufficiently sheeted, shored, and braced whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions that will, in any way, hinder or delay the progress of the work.
 2. Wood or steel sheet piling of ample design and type shall be used when necessary.
 3. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage.
 4. Where excavations are made adjacent to existing buildings or other structures, or in paved streets or alleys, the Contractor shall take particular care to sheet, shore and brace the sides of the

excavation adequately so as to prevent any undermining of or settlement beneath such structures or pavement. Underpinning of adjacent structures shall be done when necessary. The Contractor will be liable for any damage to any structure that results from his operations.

5. Sheeting, shoring or bracing materials shall not be left in place unless so shown by the plans or ordered by the Engineer. Such materials shall be removed in such manner as will not endanger or damage the new structure or any existing structures or property, either public or private, in the vicinity, and so as to avoid cave-ins or slides. No trench sheeting and bracing shall be removed until the trench has been backfilled one foot above the top of the pipe.

D. Trenching Through Dikes or Fill Sections:

1. Trenching through existing dikes or fill sections shall be accomplished in accordance with general trenching requirements as specified elsewhere.
2. Trenching for pipe lines or other utilities through dikes or fill sections under construction shall not begin until the new dike or fill section has been constructed, enlarged, or otherwise improved to an elevation 3 feet above the top of the pipe or other utility being installed.
3. Where existing dikes or fill sections are being used for the storage of liquids such as a lagoon, reservoir, pond, lake, canal, or other structure, the Contractor shall take whatever means necessary to preserve the integrity of the structure. No leakage of the stored liquid out of the structure will be allowed without the written approval of the owners of said structure.

E. Minimum Trench Widths:

1. All excavations shall be made to the lines and grades as established by the drawings, and shall be open cut through whatever material encountered. The Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such changes can be made within the easement right-of-way without adversely affecting the intended function of the facility. In areas where soil conditions permit normal excavation of the trench, the sides shall be cut as nearly vertical as possible from the bottom of the trench to a point at least 12 inches above the top of the pipe. The trench width shall conform to Table 2 of the AWWA C600 Specification.

3.5 DEWATERING

- A. The Contractor shall at all times provide and maintain the necessary equipment and means for removal of all water from excavated areas. All excavated areas shall be kept free of water while any work is in progress. Particular precautions shall be taken to prevent the displacement of structures or pipelines as a result of accumulated water.
- B. Bedding material or pipe shall not be placed in wet or unstable trenches. Soil that cannot be properly dewatered shall be excavated and dry material tamped in place to such a depth as may be required to provide a firm trench bottom.
- C. All water removed or diverted from excavations shall be disposed of in a manner that will prevent damage to adjacent property or any flooding of streets or property. Disposal of trench water through the pipeline under construction shall not be allowed.
- D. Water shall be removed and disposed of so as to not damage adjacent property or existing drainage ways.

3.6 TRENCH FOUNDATION MATERIAL

- A. Where unsuitable materials for supporting pipe cushion are encountered, these materials shall be removed and replaced with trench foundation material, as directed by the Engineer.
- B. Trench foundation material shall be placed at the specified trench width from the bottom of the excess excavation to the bottom grade line of the pipe cushion.
- C. Trench foundation material so placed shall be as shown on the trench detail drawings or specified herein. If not shown on the drawings, trench foundation material shall consist of Alabama Department of Transportation Standard Specifications for Highway Construction, Section 801, No. 57 crushed limestone.
- D. Payment for trench foundation material will be limited to situations approved in advance by the Engineer.

3.7 BEDDING AND BACKFILL

- A. General:

1. All areas where bedding is not specifically called for or required by the Engineer, the pipe shall be bedded in native soils. Bell holes shall be excavated so that the entire pipe length rests on firm soil. *(See Construction Plans Trench Details)*
2. Areas undercut by the Contractor through negligence, or his convenience, shall be backfilled and tamped with approved materials at the expense of the Contractor. In paved areas, the backfill material shall be as per the trench details as found in the Construction Plans.
3. Bedding shall meet the requirements of Paragraph 2.01 of these specifications.
4. Backfilling shall not begin before the Owner's Representative has inspected the grade and Alignment of the pipe.
5. If select backfill is not specified, backfilling to a point 12-inches above the top of the pipe, defined as the pipe zone, shall be done with good earth, sand or gravel and shall be free from large rocks or hard lumpy materials. Large rocks shall be defined as any larger than 2-inches in diameter. No materials of perishable, spongy or otherwise unsuitable nature shall be used in backfilling. It is essential that the completed backfill be done in such a manner as to minimize voids in the backfill. *(All utility trenches shall be backfilled as per the construction plans trench details)*
6. Place trench backfill material at approximately the same rate along both sides of the pipe and compact by tamping in layers not to exceed 8 inches of loose fill up to the horizontal centerline of the pipe. The intent is to cradle the pipe so that the full length is uniformly supported on firm bedding and the weight of the pipe and backfill is borne uniformly by the lower half of the pipe barrel. Special attention should be given to the backfilling and tamping procedures to insure that no voids or un-compacted areas occur beneath the pipe. The use of granular material for backfill in the pipe zone shall constitute a pay item only when so directed by the Engineer. After this, fill and compact the trench as specified below, depending upon the location of the work and danger from subsequent settlement. *(All utility trenches shall be backfilled as per the construction plans trench details)*
7. All backfilling shall be done in such a manner that will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged, or moved from its proper line or grade during backfilling operations, shall be replaced or repaired and then re-backfilled as herein specified, at the expense of the Contractor.

B. Trench Backfill and Pipe Bedding:

1. Pipe bedding and trench backfill shall be constructed as shown on the drawings for trench details. If no trench details are shown on the drawings, then the Contractor shall install the utilities as described in Paragraphs 3.07 B.3 and 3.07 B.4.
2. Where pipes are installed in unpaved areas, unless specifically shown on the drawings or called out in the Bid Schedule to be unimproved, the areas shall be considered to be Improved areas and shall be constructed accordingly.
3. Pipe Bedding and Trench Backfill – *Gravity Pipe*:
 - a. Under Pavement (Asphalt or Concrete and/or Gravel Drives):
 - Pipe Material – Ductile Iron
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)
 - Pipe Material – PVC
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)
 - b. Improved Areas:
 - Pipe Material – Ductile Iron and Concrete
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)
 - Pipe Material – PVC
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)
 - c. Unimproved Areas:
 - Pipe Material – Ductile Iron and Concrete
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)
 - Pipe Material – PVC
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)
4. Pipe Bedding and Trench Backfill – *Pressure Pipe*:
 - a. Under Pavement-Asphalt or Concrete and/or Gravel Drives:
 - Pipe Material – Ductile Iron
(All utility trenches shall be backfilled as per the construction plans trench details)
(see construction plans for backfill)

Pipe Material – PVC

(All utility trenches shall be backfilled as per the construction plans trench details) (see construction plans for backfill)

b. Improved Areas:

Pipe Material – Ductile Iron and/or PVC

(All utility trenches shall be backfilled as per the construction plans trench details) (see construction plans for backfill)

c. Unimproved Areas:

Pipe Material- - Ductile Iron and/or PVC

(All utility trenches shall be backfilled as per the construction plans trench details) (see construction plans for backfill)

** Where trench bottom is rock, provide 6" layer of #57 crushed stone trench foundation material*

3.8 CLEANING

- A. The Contractor shall thoroughly clean all areas damaged during construction of excess fill, construction debris, etc.
- B. All gutters and adjacent curbing shall be swept clean of debris and materials that may hinder storm water flow.

3.9 PROTECTION

- A. The Contractor shall protect the newly constructed pipeline from damage until final acceptance of the work.

END OF SECTION 312250

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Soil treatment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include the EPA-Registered Label for termiticide products.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each type of termite control product.
- C. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Termiticide brand name and manufacturer.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes used, and rates of application.
 - 6. Areas of application.
 - 7. Water source for application.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who is accredited by manufacturer.

1.6 FIELD CONDITIONS

- A. Soil Treatment:
 - 1. 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.
 - 2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

- A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (*Coptotermes formosanus*). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

1. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove 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, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
 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: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
 3. Crawlspace: Soil under and adjacent to foundations. 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 and below-grade walls will be penetrated.
- B. Post warning signs in areas of application.
- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

- A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 MAINTENANCE SERVICE

- A. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
 1. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions. **END OF SECTION 313116**

SECTION 322240 - CRUSHED AGGREGATE BASE

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This specification gives specific requirements for materials and installation of crushed aggregate base.

1.2 MATERIALS

- A. Materials shall meet the requirements of the latest edition of the State of Alabama Department of Transportation Standard Specifications for Highway Section 825, Gradation Type "B".

1.3 INSTALLATION

- A. No material shall be placed until the preceding layer has been approved by the Owner's testing agency. Such layer shall be properly shaped according to contours shown on the grading plan.
- B. Material shall be mixed to a uniform consistency by road-mixing, yard-mixing, or plant-mixing.
- C. Materials found not meeting the requirements of this specification shall be removed by the Contractor or brought into conformance.
- D. Material shall be spread to a uniform thickness and compacted to 100% S.P.D. as determined by AASHTO T-99. Finished material shall be to the thickness shown in the drawings.
- E. Material shall extend the full width to and shaped to accept curbing as shown by the typical section.
- F. Material shall be kept at or near optimum moisture during the compaction process and until the succeeding layer is placed.
- G. The Contractor shall shape the finished base to reasonably close conformity to the contours shown by the grading plan.
- H. The Contractor shall maintain the base layer until such time as the succeeding layer is placed.
- I. The Contractor shall install all underground utilities and sleeves prior to base installation. If base is installed, compacted tested, etc., and utilities are later installed, then the base shall be considered contaminated and shall be removed/reinstalled, recompacted, and retested at the Contractor's expense, no exceptions. Final base is NOT considered temporary stone; therefore, contamination shall not be allowed. Contaminated base shall be removed and replaced at the Contractor's expense.
- H. When proofrolling is required by the Owner's Representative, it shall be proofrolled with a fully loaded, triaxle dump truck at a minimum.

END OF SECTION 322240

SECTION 322272 - RIPRAP

PART 1 - GENERAL

1.1 Work Included:

- A. Riprap shall be placed within the limits and dimensions shown on the drawings or as directed by the Engineer.
- B. Riprap shall be of the Class shown on the plans and listed in the Unit Price Bid Schedule and shall be defined in the latest edition of the ALDOT Standard Specifications for Highway Construction.
- C. All slopes to be treated with riprap shall be trimmed to the lines and grades indicated on the drawings. Loose material shall be compacted by methods approved by the Engineer.
- D. Geotextile fabric shall be placed under all riprap. Fabric shall be Mirafi FW 700 or approved equal.
- E. Stone bedding shall be placed on the geotextile fabric prior to installing the riprap. The permanent riprap installation with stone bedding and geotextile filter fabric detail is shown in the plans.

END OF SECTION 322272

SECTION 322290 – SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

- A. Section 312250 – Trenching, Backfill, and Compaction

PART 2 - MATERIALS

2.1 TEMPORARY BERMS

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

2.2 TEMPORARY SLOPE DRAINS

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

2.3 SEDIMENT STRUCTURES

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

2.4 CHECK DAMS

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

2.5 TEMPORARY SEEDING AND MULCHING

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

2.6 BRUSH BARRIERS

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

2.7 BALED HAY OR STRAW CHECKS

- A. Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw, containing five (5) cubic feet or more of material.
- B. Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltation erosion or water runoff is a problem.

2.8 TEMPORARY SILT FENCES

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

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be responsible for obtaining a NPDES permit in accordance with requirements of this section and notes on the plans notes sheet and in compliance with regulations established by the EPA and the ADEM. The Contractor shall be responsible for providing the Qualified Credentialed Professional (QCP) and/or Qualified Credentialed Inspector (QCI) to perform inspections as required by the permits. The costs of inspections and associated documentation shall be the responsibility of the Contractor. The QCP/QCI shall inspect all BMP's daily and keep daily inspection reports in a log book that shall be submitted for review by the Owner's Representative prior to approval of the monthly pay request.
- B. The Contractor shall exercise planning and forethought in coordinating the work of protecting the project and adjoining properties from soil erosion by effective and continuous erosion control methods of either a temporary or a permanent nature.
- C. Prior to construction, the Contractor shall meet with the Engineer and review in detail the expected problem areas in regard to the erosion control work. Different solutions shall be discussed so that the best method might be determined. It is the responsibility of the Contractor to develop an erosion control plan acceptable to the Engineer. Erosion control measures shown on the Drawings or in Standard Details are the minimum required and are meant as a guide for the Contractor.
- D. Before beginning work on the site, the Contractor shall submit to the Engineer, for his review and approval, a plan for control of soil erosion.
- E. The Contractor shall plan his clearing work and his entire construction operations in such a manner as to effectively control soil erosion and prevent pollution of streams, ponds, and/or drains as would result from silt or soil runoff or as would result from any materials used in the construction operations such as oil, grease, paints, chemicals, or any construction debris.
- F. The Contractor shall intercept and block drainage from the construction site by means of silt fences, silt barriers, sedimentation pools or other measures as required.
- G. Silt fences, wherever used on the site, shall consist of hay bales securely fastened in place or, if approved, permeable-barrier fabric designed to filter water and retain silt. Fabric shall be set securely in the ground and firmly held in place.
- H. The erosion control work shall cover all disturbed areas within the project and/or easement along which the project has been installed. Erosion control work shall not be limited to the easement but shall include all disturbed areas as necessary.

3.2 METHODS OF CONSTRUCTION

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches, and settling basins.
- B. Construction operations shall be restricted to the areas of work indicated on the Plans and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

- C. Excavated soil material shall not be placed adjacent to wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If, for any reason, construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer at no cost to the Owner.
- D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.
- E. The Contractor shall not pump silt-laden water from trenches or other excavations into wetlands or adjacent watercourses. Instead, silt-laden water from excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to, the following:
 - 1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
 - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface water areas.
 - 3. Pumping of silt-laden water from trenches or excavations into surface waters or wetlands.
 - 4. Damaging vegetation adjacent to or outside of the construction area limits.
 - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
 - 6. Permanent or unauthorized alteration of the flow line of any stream.
- G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

3.3 EROSION CHECKS

- A. The Contractor shall furnish and install baled hay or straw erosion checks in all locations indicated on the Plans, surrounding the base of all deposits of stored excavated materials outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Plans, shall be installed immediately after the site is cleared and before excavation has begun at the locations indicated. Checks located around stored material shall be located approximately 6-feet from that material. Bales shall be held in place with two 2-inches by 2-inches by 4-foot wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short-circuiting of the erosion check.

3.4 MAINTENANCE OF EROSION CONTROL FEATURES

- A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.
- B. Silt fences shall have sediment deposits removed if it reaches a depth of fifteen inches (15") or ½ the height of the fence. Sediment removed from the silt fence shall be removed from the site.
- C. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.

3.5 CONSTRUCTION RUNOFF PERMITTING

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

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

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

END OF SECTION 332290

SECTION 322500 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

1.2 GENERAL INFORMATION

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

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

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

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

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

1.3 REFERENCES

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

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

- A. The Contractor shall comply with all environmental laws and requirements pertaining to the work.

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Prime Coat:
 - 1. Prime Coat shall be emulsified asphalt, Type AE-P, tar types RT2 or RT3, or cutback asphalts MC 250, RC70 or RC250 as defined in Section 804 of the Alabama Department of Transportation Standard Specifications.
 - 2. Prime Coat shall be applied at the rate of 0.22 to 0.25 gallons per square yard over the entire area to be treated with asphalt.
- B. Tack Coat:
 - 1. Tack coat shall be emulsified asphalt type SS-1, SS-1h, or RS-2 or Asphalt Cement Grade AC-10 or AC-20 as defined in Section 804 of the State of Alabama Department of Transportation Standard Specifications.
 - 2. Tack Coat shall be applied at a rate not to exceed 0.10 gallons per square yard.
- C. Asphalt Patch:
 - 1. Asphalt paving used in patching shall be Improved Bituminous Concrete Binder as defined in Section 424 of the State of Alabama Department of Transportation Standard Specifications.
 - 2. Materials shall meet the requirements of Article 424.02 of the above mentioned specifications.
 - 3. The Contractor shall refer to the drawings for the quantity of material to be applied per square yard.
- D. Asphalt Paving:
 - 1. Asphalt paving used in paving shall be Improved Bituminous Concrete Plant Mix, meeting the specification outlined in Section 424 of the State of Alabama Department of Transportation Standard Specifications.
 - 2. Asphalt final layer placed for paving and/or overlay in streets, parking lots, drives, and patches shall be Improved Bituminous Concrete Wearing Surface, Mix "A" and all materials used shall conform to Article 424 of the State of Alabama Department of Transportation Specifications.
 - 3. The Contractor shall refer to the drawings for the quantity of material to be applied per square yard.
- E. Traffic striping and control markings shall conform to Sections 701 and 703 of the State of Alabama Department of Transportation Standard Specifications for Highway Construction. All striping, delineations, markers, etc., damaged or destroyed during the construction shall be replaced by the Contractor at his expense.
- F. Before overlaying the street, the Contractor shall raise or lower all valve boxes, manholes and other embedded items, including items that have previously been paved over. No extra payment will be made for these adjustments.

2.2 EQUIPMENT

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

2.3 TEMPERATURE AND WEATHER REQUIREMENTS

- A. Prime and Tack Coat:
 - 1. Bituminous materials shall not be placed on wet surfaces or when the air temperature is below 60-degrees F.

2. Bituminous materials shall not be placed when the temperature is expected to fall below freezing during the night regardless of the daytime temperature.

B. Asphalt Patching and Overlay:

1. The asphalt mixture shall be placed only upon an approved underlying course that is dry.
2. Asphalt layers of 200-pounds per square yard or less shall not be placed when the air temperature is below 40-degrees F. The air temperature must be 40-degrees F. and rising before the spreading operation is started and the spreading operation shall be stopped when the air temperature is 45-degrees F. and falling.
3. For asphalt layers over 200-pounds per square yard, the above temperatures shall be lowered by 5-degrees.

PART 3 - EXECUTION

3.1 EXECUTION

A. Prime and Tack Coat:

1. All loose material, dust and foreign material shall be removed from the surface. Cleaning shall be continued until all caked and loose dirt and dust are removed.

B. Asphalt Patching:

1. All designated areas to be patched shall be trimmed to neat vertical lines to the depth of patch specified. All loose material shall be removed. A prime or tack coat shall be applied as specified above. The asphalt shall be placed and compacted to a degree that further consolidation of the patch is not anticipated.
2. Any patched areas that do consolidate shall be replaced or additional material brought in to bring the patch up to the surrounding level.
3. All asphalt or concrete streets, parking areas and drives shall be patched the same day they are cut. Temporary or cold patch material may be used until the permanent patch can be placed; however, no extra payment will be made for temporary patching.
4. The Contractor shall delineate with construction warning signs (lighted at night) any "bump" and/or rough patch areas that will greatly impact the public until the patch is complete and smoothly graded with no settlement.

3.2 APPLICATION

A. Prime and Tack Coat:

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

B. Asphalt Patch and Overlay:

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

3.3 TESTING AND SURFACE REQUIREMENTS

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

3.4 MAINTENANCE

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

END OF SECTION 322500

SECTION 322528 - CONCRETE CURB AND GUTTER

PART 1 - GENERAL

1.1 WORK INCLUDED

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

1.2 FORMS

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

1.3 MACHINE CURBS

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

1.4 PROTECTION OF CURBS

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

END OF SECTION 322528

SECTION 322830 - SOLID SOD

PART 1 - GENERAL

1.1 Related Documents

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

1.2 Labor, Materials, and Equipment

- A. General: The Contractor shall furnish all labor, material and equipment required to complete the work described herein in strict accordance with the drawings and/or terms of the contract.
- B. Grading: All previously established grades shall be maintained in conformance with the drawings and/or other specifications.
- C. Materials:
 - 1. Class of the turfgrass shall be Certified Turfgrass Sod.
 - 2. This turfgrass sod shall be composed of Bermuda grass. The Bermuda sod shall be used in all sodded areas throughout the project, unless otherwise noted on the plans.
- D. Topsoil: All areas of the project to receive turfgrass sod over existing soils, shall first receive a 4 inch in-place depth of approved topsoil. Application of topsoil does not relieve the Contractor from responsibilities herein described for improving existing soils and surface conditions. See Section 322820 Fertilization & Soil Preparation.

1.3 Certification Standards

- A. Provide three copies of the state certification inspection certificate of the turfgrass to be used on the project to the Owner's Representative. State certification inspection assures satisfactory genetic identity and purity, overall high quality and freedom from noxious weeds as well as excessive amounts of other crop and weedy plants at time of harvest.
- B. All seed used or original plant material used in turfgrass quality sod must be certified.
- C. The turfgrass sod must meet the published state standards for certification.

1.4 Sod Harvesting and Material Quality

- A. Thickness of Cut: Turfgrass sod shall be machine cut at a uniform soil thickness of 5/8 inch, plus or minus 1/4 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch.
- B. Pad Size: Individual pieces of turfgrass sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus one-half inch on width and plus or minus five percent on length. Broken pads and torn or uneven ends will not be acceptable.
- C. Strength of Sod Selection: Standard size sections of sod shall be strong enough that when grasped at one end, it can be picked up and handled without damage.
- D. Moisture Content: Turfgrass sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.
- E. Mowing Height: Before harvesting, the turf shall be mowed uniformly at a height of 1 to 1 ½ inches on cool season grasses (i.e., bluegrass, rye and fescue); and ½ to 3/4 inches on warm season grasses (i.e., centipedegrass, bentgrass, zoysiagrass, and bermudagrass).
- F. Time Limitations: Turfgrass sod shall be harvested, delivered and installed/transplanted within a period of 36 hours unless a suitable preservation method is approved by the Landscape Architect prior to delivery. Turfgrass sod not transplanted within this period shall be inspected and approved or rejected by the

Owner's Representative prior to its installation.

- G. Thatch: Turfgrass sod shall be relatively free of thatch, up to ½ inch allowable (uncompressed).
- H. Diseases, Nematodes and Insects: Turfgrass sod shall be reasonably free of diseases, nematodes, and soil-borne insects. State nursery and/or plant materials laws require that all sod entering inter-state commerce be inspected and approved for sale. The inspections and approval must be made by the state agricultural department, office of the entomologist.
- I. Weeds as Applicable to Nursery Grown Turfgrass Sod: Sod shall be free of objectionable grassy and broadleaf weeds. Turfgrass sod shall be considered free of such weeds if less than five such plants are found per 100 square feet of area. Turfgrass sod will not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnson grass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
- J. Inspection: The grower will submit to the purchaser prior to delivery, information as to the field location, species and percentage of purity of the turfgrass sod he intends to deliver.

1.5 Transplanting

- A. Moistening the Soil: During periods of higher than optimal temperature for the species being specified and after all unevenness in the soil surface has been corrected, the soil shall be lightly moistened immediately prior to laying the turfgrass sod.
- B. Starter Strip: The first row of turfgrass sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the pieces are not stretched or overlapped and that all joints are butted tightly to prevent voids that would cause air drying of the roots.
- C. Sloping Surfaces: On 3:1 or greater slopes, turfgrass sod shall be laid across the angle of the slope, with staggered joints and secured by tamping, pegging or other approved methods of temporarily securing each piece.
- D. Watering and Rolling: Contractor shall water the turfgrass sod immediately after transplanting to prevent excessive drying during the progress of the work. As sodding is completed in any one section, the entire area shall be lightly rolled. It shall then be thoroughly watered to a depth sufficient that the underside of the new sod pad and soil immediately below the pad are thoroughly wet. The General Contractor shall be responsible for having adequate water available at the site prior to and during installation.

PART 2 - ACCEPTANCE AND GUARANTEE

2.1 Acceptance

- A. Acceptance of the transplanted turfgrass sod shall be on the completion of the entire project.
- B. Sod installed is to be maintained by the Contractor until the project is accepted. Maintenance includes bi-weekly mowing during the growing season, watering, fertilizing, and application of herbicide as necessary.

2.2 Disclaimer

- A. The Contractor shall not be held liable for damages incurred to the turfgrass sod caused by materials not applied by him or under supervision nor for those caused by acts of God or vandalism.

2.3 Guarantee

- A. The Contractor shall guarantee work covered by this specification to the extent that all transplanted turfgrass sod shall be uniform in color, leaf texture and shoot density and be reasonably free of visible imperfections at the time of acceptance. And the Contractor shall further guarantee the turfgrass sod against any imperfections resulting from improper installation techniques or soil preparation for a period of one year, with the beginning of the guarantee period beginning upon the date of final acceptance by the Owner's Representative.

END OF SECTION 322830

SECTION 322900 - TOPSOIL

PART 1 - GENERAL

1.1 TOPSOIL

Topsoil used shall be equivalent to Bama sandy loam, and processing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass, or other vegetation. Topsoil shall have permeability .6-6 inches per hour, low shrink-swell potential, pH 5.0-7.0, minimum 2% organic matter. Topsoil shall not be handled in a frozen or muddy condition. Soil shall be free of subsoil, brush, organic litter, or objectionable weeds, clay, clots, stumps, stones, roots and debris 1" or larger, or any other material harmful to plant growth or hindrance to planting or maintenance operations. Soils to be free of noxious weed seed or vegetation propagules. Should regenerative materials be present in the soil, Contractor shall eradicate and remove such growth, both surface and root, which may appear in the imported materials within 1 year following acceptance of work.

The mechanical analysis of the soil shall be as follows:

Sieve Size	Percent Passing
1" Mesh	99 – 100 percent
¼" Mesh	97 – 99 percent
No. 100 Mesh	40 – 60 percent
No. 200 Mesh	20 – 40 percent

END OF SECTION 322900

SECTION 322920 - SEEDING AND MULCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This specification covers the site preparation, furnishing and applying agricultural limestone, fertilizer, seed, and mulch, labor and equipment necessary for seeding unimproved areas encountered during construction.

1.2 RELATED SECTIONS

- A. Section 312250 - Trenching, Backfill and Compaction

1.3 UNIT PRICES (PER BID SCHEDULE UNLESS LUMP SUM CONTRACT)

- A. Seeding and mulching shall be paid for by one of the following methods:
 - 1. Square yard
 - 2. Acre
- B. The Contractor shall refer to the Bid Schedule for the appropriate unit of payment.
- C. All methods of payment shall include preparing the area for seeding, including but not limited to furnishing and applying agricultural limestone, fertilizer, seeding and mulching, water as required, and all labor and equipment necessary for a complete application and maintenance.

1.4 PERFORMANCE REQUIREMENTS

- A. The acceptance of designated seeded areas will be based on verification of a satisfactory stand of grass in the season for each seed species required by the mix designated for use. If a satisfactory stand of grass is not established, the area shall be re-seeded without additional cost to the Owner. Such re-seeding shall be repeated as many times as necessary to establish a satisfactory stand of grass.
- B. A satisfactory stand is defined as a cover of healthy, living plants, after true leaves are formed, of the seed species required by the mix designated for use in which gaps larger than five (5) inches square do not occur.

1.5 MAINTENANCE

- A. The Contractor shall maintain the seeded area until final acceptance of the work.
- B. All costs associated with application of water during this construction and maintenance period shall be the responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Seed: All seed shall meet the requirements of these specifications and comply with the current Seed Law, Act No. 424, General Acts 1963, and rules and regulations promulgated thereunder and any revision of the Act. They shall be tested within nine months prior to use in accordance with the latest edition of Rules for Seed Testing, approved by the Association of Official Seed Analysis. The information on the seed tag of each bag of seed will be inspected and reviewed by the Engineer prior to planting and as requested. A representative sample of seed will be furnished for testing to determine the correctness of labeling. The purity and germination of hard seed shall not be less than the percentage tabulated below:

TYPE	PURITY	GERMINATION AND HARD SEED
Kentucky 31 Tall Fescue	98%	85%
Hulled Common Bermuda	97%	85%
Abruzzi Rye	98%	80%
Pensacola Bahaigrass	90%	85%

No seed shall contain more than 1% weed seed. Limitations of noxious weed seeds will be as specified by rules and regulations for administration of the current State Seed Law.

- B. Agricultural Limestone: The limestone shall have a neutralizing value of 90% calcium carbonate or better and meet the following gradation requirements:

Sieve Size #10, 90% by weight passing.
Sieve Size #60, 50% by weight passing.

- C. Fertilizer: The fertilizer shall be a commercial grade, complying with the current State Fertilizer Laws. Fertilizer shall be of a commonly accepted analysis and conform to the following table:

PERCENT BY WEIGHT

TYPE	NITROGEN	PHOSPHORUS	POTASH
15-0-15	15		15
13-13-13	13	13	13
10-10-10	10	10	10
8-8-8	8	8	8
0-14-14	0	14	14
4-12-12	4	12	12
4-16-8	4	16	8
Cottonseed Meal	6.56		
Super Phosphate		18.0	
Ammonium Nitrate	33.5		
Ammonium Sulphate	20.5		
Nitrate of Soda	16.0		
Muriate of Potash			60.0

If the fertilizer is furnished from bulk storage, the Contractor shall furnish the supplier certification of analysis and weight. A representative sample of the fertilizer shall be furnished for chemical analysis at the discretion of the Engineer.

- D. Mulch materials shall be wheat, oat, barley, or rye straw or tame hay. The materials shall be air dried and shall not be spoiled or rotted to the extent that plant stems are caked together. Mulch material containing noxious weed seeds will not be acceptable. The Contractor shall provide a method satisfactory to the Engineer for determining weight of mulch furnished.
- E. Water shall be potable and free of substances that are harmful to the growth of plantings.
- F. Hydroseeding and mulching shall be Conowed Fibers 2500, or approved equal.

2.2 EQUIPMENT

- A. Spreaders shall be mechanically operated or hand operated, capable of providing a uniform application rate over the area to be covered. Broadcast spreading by hand will not be allowed.

2.3 SEEDING MIXTURES

- A. Seeding mixtures shall be as specified by the Supplementary Conditions. Seeding mixtures shall be classed according to the time of year when seeding will take place.
- B. If no seeding mixtures are specified by the Supplementary Conditions, the following mixtures and application rates shall apply:

SEED	APPLICATION RATE/ACRE
Kentucky 31 Tall Fescue	40 Pounds
Hulled Common Bermuda Grass	8 Pounds
Pensacola Bahiagrass	30 Pounds
Abruzzi Rye	30 Pounds

PART 3 - EXECUTION

3.1 PREPARATION

- A. The Contractor shall dress the area to be seeded to a reasonably smooth surface, sloped to drain, and tie with surrounding contours, sidewalks, drives, etc.
- B. The Contractor shall break all lumps, clods, and crusty surfaces by tillage, discing or other methods approved by the Engineer. All boulders, stumps, roots and other particles that would interfere with a mowing operation shall be removed.

3.2 APPLICATION

- A. Fertilizer shall be spread uniformly in sufficient quantity to provide at least 120 pounds of nitrogen, 120 pounds of available phosphoric acid, and 120 pounds of total potash per acre as computed from the nominal contents of fertilizing ingredients.
- B. Agricultural lime shall be uniformly and evenly applied at a rate of 4,000 pounds per acre.
- C. The fertilizer and lime shall be thoroughly mixed into the soil by discing, tilling or other methods approved by the Engineer.
- D. The Contractor shall take precautionary measures when applying fertilizer and lime around buildings, sidewalks and drives.
- E. Seed shall be uniformly and evenly spread over the area at rates specified in the supplemental conditions or in Paragraph 2.03.B of this Specification.
- F. Mulch shall be applied at the rate of 1-1/2 tons per acre. Mulching shall be done within three days after seeding.

3.3 CLEANING

- A. The Contractor shall clean drives, buildings, sidewalks and other areas of all construction debris and equipment, including seed, fertilizer, lime, mulch, etc.

END OF SECTION 322920

SECTION 322940 - PAINTING AND STRIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section covers all temporary and permanent painting and striping of the parking areas, roadways, and pedestrian crosswalks.

1.2 REFERENCE SPECIFICATIONS

- A. All materials, equipment, application methods, cleaning and installation shall be in accordance with Alabama Department of Transportation Standard Specifications, Latest Edition, Sections 701, 856, and 857, except as modified herein.

1.3 APPLICATION

- A. Prepare surface in accordance with ALDOT 701.
- B. Rate of application shall not exceed 80 square feet per gallon.
- D. Temporary painting shall be done on all areas including striping, pedestrian walkways and parking within the roadways immediately after completion of the asphalt placement and after utility installations that eliminate substantial portions of the existing striping. Permanent painting and thermoplastic striping of the roadways and parking lot shall be done after the asphalt has cured for 30 days.

END OF SECTION 322940

SECTION 322945 - CAST-IN-PLACE CONCRETE - CIVIL

PART 1 - GENERAL

1.1 OMIT

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the Storm Structures.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Material Certificates: For each of the following, signed by manufacturers:
1. Curing compounds.
 2. Bonding agents.
 3. Repair materials.
- E. Field quality-control test and inspection reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. 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.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I or II, ASTM C-595 Type IL, Supplement with the following if available:
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Available Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edoco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - p. Unitex; Pro-Film.
 - q. US Mix Products Company; US Spec Monofilm ER.
 - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 1. Available Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoco; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
 - m. Tamms Industries, Inc.; Horncure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. US Mix Products Company; US Spec Maxcure Resin Clear.
 - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioCure 100.

2.8 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.9 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials:
1. Fly Ash: 25 percent maximum.
 2. Combined Fly Ash and Pozzolan: 25 percent maximum.
- C. Limit water-soluble, chloride-ion content in hardened concrete to .30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45
 3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1-inch.
 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

2.11 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner may engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
 - 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 - 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - 9. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
 - 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not

been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 322945

SECTION 332433 - STORM SEWERS

PART 1 - GENERAL

1.1 WORK INCLUDED

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

1.2 PRODUCTS

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

1.3 EXECUTION

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

1.4 CONSTRUCTION STAKING

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

END OF SECTION 332433

SECTION 332600 - DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section of specifications covers the material and installation requirements for ductile iron pipe and fittings.
- B. The testing requirements for materials, in-place, specified under this section shall conform to Section 332660 – Water System and Section 332722 – Sanitary Sewer System.

1.2 RELATED SECTIONS

- A. Section 312250 – Trenching, Backfilling, and Compaction
- B. Section 332722 – Sanitary Sewer System
- C. Section 332660 – Water System

1.3 REFERENCES

- A. ANSI/AWWA C104/A21.4 – American National Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- B. ANSI/AWWA C105/A21.5 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
- C. ANSI/AWWA C110/A21.10 – American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in., for water and other liquids.
- D. ANSI/AWWA C111/A21.11 – American National Standards for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- E. ANSI/AWWA C115/A21.15 – American National Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- F. ANSI/AWWA C150/A21.50 – American National Standard for the Thickness Design of Ductile-Iron Pipe.
- G. ANSI/AWWA C151/A21.51 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast for Water and Other Liquids.
- H. ANSI/AWWA C153/A21.53 – American National Standard for Ductile-Iron Compact Fittings for Water Service.
- I. AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances.

1.4 QUALITY ASSURANCE

- A. All piping, fittings, and appurtenances installed by the Contractor shall be new and unused and shall be suitable for the intended purposes.
- B. Each joint of pipe shall be plainly marked at the site of manufacturer to indicate the class, thickness, and/or strength.

1.5 DELIVERY, STORAGE AND HANDLING

- A. All ductile iron pipe and fittings are subject to inspection at delivery and other times as deemed necessary by the Engineer. Any pipe and/or fittings damaged during delivery shall be promptly removed from the job site.
- B. Ductile-iron pipe shall be stored off the ground supported by timbers, railings or concrete supports and shall be of sufficient size to avoid contact with the ground or adjacent piping. Supports shall have chocks to prevent movement. Stacking shall be low enough to provide a safe condition, especially in neighborhoods and accessible areas.

- C. Pipe and fittings shall be stored to prevent damage to the interior or exterior lining. The interior of all pipe and fittings shall be kept free of dirt and debris. Ductile iron pipe shall not be stacked higher than specified in Table 1 of AWWA C600.
- D. Pipe and fittings shall be loaded and unloaded by hoists or skids to avoid sudden impact to the material. In no case shall the pipe or fittings be dropped. Slings, hooks, or pipe tongs shall be padded to avoid damage to the exterior or interior linings.
- E. Gaskets for mechanical joint and push-on joint pipe and fittings shall be stored in a cool dry place out of direct sunlight. Contact with petroleum-based substances is prohibited.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. American Cast Iron Pipe Company
- B. U.S. Pipe
- C. Others as approved by the Engineer

2.2 MATERIALS: DUCTILE IRON PIPE AND FITTINGS SHALL CONFORM TO THE FOLLOWING

- A. Pipe and Fittings
 1. In general, ductile iron pipe for underground work shall have push-on or mechanical joints; ductile iron pipe for exposed work shall have flanged joints. Where shown on the drawings, grooved-end pipe shall be used to allow removal of valves and fittings.
 2. Ductile iron pipe with push-on or mechanical joints shall conform to ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, latest revision. Push-on or mechanical joints shall conform to the requirements of ANSI/AWWA C111/A21.11.
 3. Pipe pressure classes and wall thicknesses shall be in accordance with bury depths and laying conditions as specified in C150/A21.50 and C151/A21.51. Unless otherwise shown differently on the Drawings or in the Bid Schedule minimum pipe requirements are as follows:
 - a. Minimum pressure classes for buried *water* pipe shall be 350 psi for pipes ≤ 12 inches, 250 psi for pipes ≤ 24 inches, and 150 psi for pipe ≥ 30 inches in diameter.
 - b. Minimum thickness classes for buried *sewer* pipe shall be AWWA thickness Class 52 for pipes ≤ 16 inches, Class 50 for pipes ≥ 18 inches in diameter.
 4. Ductile iron pipe with flanged or grooved joints shall conform to the requirements of ANSI/AWWA C115/A21.15 (including appendix) and shall have a pressure rating of 350 psi for pipes ≤ 12 inches, and a pressure rating of 250 psi for pipes ≥ 14 inches. Flanges for threading onto ductile iron pipe shall conform to the requirements of ANSI/AWWA C115/A21.15.
 5. Fittings for ductile iron pipe with push-on or mechanical joints shall conform to the requirements of ANSI/AWWA C110/A21.10 and shall have a pressure rating of 350 psi for sizes ≤ 24 inches, and a pressure rating of 250 psi for sizes ≥ 30 inches. Ductile iron fittings for ductile iron pipe with push-on or mechanical joints may be compact fittings conforming to ANSI/AWWA C153/A21.53. Joints shall be mechanical joints conforming to the requirements of ANSI/AWWA C111/A21.11.
 6. Fittings for flanged ductile iron pipe shall conform to the requirements of ANSI/AWWA C110/A21.10 (including appendix) and shall have a pressure rating of 250 psi. Fitting flanges shall conform to the requirements of ANSI/AWWA C110/A21.10. Gaskets for flanged joints shall be full face of first quality red rubber, 1/8-inch thick.

7. All fittings with mechanical joints shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases.
 - a. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN.
 - b. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA/A21.53 of the latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psig with at minimum safety factor of 2:1 and shall be MEGALUG by EBAA Iron Inc., or approved equal.
- B. Coatings and Linings:
1. Exposed piping shall have exterior rust inhibitive primer coating compatible with finished paint.
 2. All ductile iron pipe and fittings for underground installation shall receive an exterior bituminous coating of 1-mil minimum thickness.
 3. All ductile iron pipe and fittings shall have an interior cement-mortar lining with asphaltic seal coat in accordance with ANSI/AWWA C104/A21.4.
 4. All sanitary sewer ductile iron pipe and fittings shall be lined a coating of Permax CTF. Lining material shall be two (2) component, amine cured novolac epoxy containing a minimum of 20% by volume of ceramic pigment. There shall be no less than 97% solids by volume. The minimum film thickness shall be 40 mils of lining material applied and must be certified by the lining manufacturer.
 5. Where shown on the drawings or required by the City Engineer, ductile iron pipe and fittings situated in aggressive soils shall be polyethylene wrapped in accordance with ANSI/AWWA C105/A21.5. Wrappings shall be 8-mil low density or 4-mil high density, cross-laminated (HDCL) polyethylene film.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The contractor shall examine the site, trench and surrounding conditions to assure proper installation of the pipe and associated fittings.
- B. The contractor shall examine pipe and fittings for any scratches or abrasions to the coating or linings, or other physical damage prior to its installation.
- C. Trenches shall be inspected for proper alignment and grade. Check trench bottom to assure proper clearance from other utilities, pipelines or existing structures.
- D. Any bedding required by the drawings or specifications shall be installed prior to pipe placement.

3.2 INSTALLATION

- A. Pipe installation shall be according to this section of the specification and the manufacturer's instructions and/or referenced specifications.
- B. Every care shall be taken in the handling, cutting, and laying of pipe and fittings to avoid damaging the interior or exterior coating. Damaged or defective areas shall be repaired or replaced to the satisfaction of the Engineer.
- C. Any ductile iron fitting showing a crack, any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the job site. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe

used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack. Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters or knives adapted to the purpose. All cut ends shall be beveled and shall be examined for possible cracks caused by cutting. Special care shall be taken to avoid excessive heat during cutting which might damage pipe lining.

- D. Each section of ductile iron pipe shall be placed in the prepared trench with the full length of the barrel resting upon the pipe bed and with the pipe bell over a bell hole excavated at the proper location to accommodate the bell. No temporary supports under the pipe such as bricks, rocks, etc., shall be permitted.
- E. Any pipe found defective shall be replaced. Cracked pipe may be cut as specified previously in this section if authorized by the Engineer.
- F. Pipeline shall be laid with bells in direction of laying, unless it is necessary to do otherwise to make connections to existing pipe. Where pipe is to be laid on a slope, the direction of laying shall be from downstream to upstream.
- G. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.
- H. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade as shown on the drawings.
- I. Assembly of ductile iron push-on joints and mechanical joints shall be in accordance with AWWA Specifications C600, Section 3.4. The contractor shall use particular care in cleaning the socket, plain end and gasket. Mechanical joint bolts shall be tightened to the proper torques shown in Table 4, AWWA Standard C600.
- J. Deflections of ductile iron pipe having mechanical joints, if authorized by the Engineer, shall not exceed the deflection limits shown in Table 6, AWWA Standard C600. All bolts and set screws shall be checked immediately before backfilling.
- K. Deflections for push-on joint pipe shall conform to Table 5 of AWWA C600.
- L. At times when pipe laying is not in progress, the open ends of pipe shall be closed by the use of pipe plugs or other methods approved by the Engineer to keep mud, water, and other debris out of the pipe.
- M. Pipe cutting for the insertion of valves and fittings shall follow the manufacturer's recommendations. No torch cutting shall be allowed. Interior and exterior coatings shall be repaired and touched-up per manufacturer's recommendations.
- N. Trenches shall be backfilled according to Section 312250 - Trenching, Backfill and Compaction.

END OF SECTION 332600

SECTION 332607 – PRECAST CONCRETE MANHOLES AND COVERS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

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

1.2 RELATED SECTIONS:

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

1.3 REFERENCES:

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

1.4 QUALIFICATIONS:

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

1.5 ENVIRONMENTAL REQUIREMENTS:

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

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Precast Manhole Base and Sections:
 - 1. All precast manholes shall be new, unused manholes delivered directly from the manufacturer to the job site. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the outside of the barrel.
 - 2. Precast concrete manholes shall be of reinforced concrete manhole sections conforming to the requirements of ASTM C478. The concrete when tested in compression shall not be less than 4000 psi and absorption shall not exceed 9%.
 - 3. Precast manhole base and sections shall be a minimum of 48-inches inside diameter. Precast manhole base shall have a minimum wall thickness of 5 inches and minimum bottom thickness of 6 inches. Minimum wall thickness of the manhole riser sections shall be 5 inches for 48" I.D. sections, 6 inches for 60" I.D. sections, and 7 inches for 72" I.D. sections.

4. Manhole base riser, riser, transition, and cone sections shall have offset tongue and groove joints and shall be made watertight with prelubricated rubber gaskets conforming to ASTM C443 and butyl sealant waterstops. Pre-lubricated gaskets shall be Tylox Superseal as manufactured by Hamilton-Kent; butyl sealant waterstop shall be Conseal CS-231, in widths as recommended by the manufacturer.
 5. Manholes shall be assembled with the fewest number of sections to makeup the required height, thereby reducing the number of joints. The use of more than one riser section of 16 inches or less shall be prohibited. The Engineer may require that any manhole not composed of the minimum number of sections be replaced.
 6. Precast eccentric cone shall be provided at top section of manhole. Eccentric cone shall have the same reinforcing as manhole base and sections. Cone sections shall be made with a minimum 5-inch wall thickness at the bottom and 8-inch wall thickness at the top. Where watertight manhole frame and covers are indicated on the drawings, cone sections shall be supplied with four (4) stainless steel anchor bolts.
 7. Two lift holes shall be cast into each cone or riser section for purposes of handling and placement.
 8. Openings for inlet and discharge sewer pipes shall be provided in the manhole base section and in the riser section for drop manholes. Openings shall be at positions and elevations as indicated on the plans, and may be cast into the manhole wall or mechanically cored at the manufacturing facility. Openings shall be sized to accommodate the flexible manhole sleeve.
- B. Precast Concrete Adjusting Rings:
1. Provide precast concrete adjusting rings, as required, between top of eccentric cone and finished grade.
 2. Precast concrete adjusting rings shall be of same materials of construction as manhole bases and sections, grooved top and bottom.
 3. Adjusting rings shall be 3 or 4 inches high by 5 inches thick. Maximum combined height of adjustment rings shall be limited to 8 inches.
- C. Flexible Manhole Sleeves:
1. Flexible manhole sleeves suitable for use in precast or cored openings utilizing premolded shapes positioned with expansion rings shall comply with the requirements of ASTM C923 and shall be manufactured by Kor-N-Seal or approved equal. Flexible connectors shall be installed as recommended by the manufacturer.
- D. Manhole Steps:
1. Manhole steps shall be Copolymer Polypropylene Plastic Coating over 1/2-inch minimum Grade 60 steel reinforcing, 12-inches wide, with slip resistant surface.
 2. Manhole steps shall conform to ASTM C478 as manufactured by M.A. Industries, Model PSI-PF, or equal. Steps shall be centered under the manhole cover opening and be vertically aligned on 16-inch centers.
- E. Manhole Frames and Covers:
1. Manhole frames and covers shall be close-grained, cast-iron, smooth, clean, free of blisters, blowholes and other defects and conform to ASTM A48, Class 30B. Plane or grind bearing surfaces to ensure a flat, fine surface. Castings judged to be defective by the Owner or Engineer will be rejected and shall be replaced by the Contractor.
 2. Covers and frames shall be "Heavy-Duty" type, rated for a minimum of H-20 loading. Covers and frames shall be made in the United States.

3. Manhole covers shall be cast with two non-penetrating type pick holes. Covers shall not have vent holes.
 4. Manhole frames and covers shall be of either Standard Type (non-bolted) or Watertight Type (bolt-down), as indicated on the drawings. If not indicated, manhole covers shall be standard type. In locations where the manhole rim elevation is below the 100-year flood elevation, manhole frame and covers shall be Watertight Type.
 5. Manhole frames and covers shall conform to the manufacturer dimensions required by the City of Tuscaloosa and shown on the Drawings.
 6. When watertight frames are required, manhole joints shall be supplied with 3" x 16" x 1/2" bitumastic-coated steel strap anchors and bolts as shown on the Drawings.
- F. Non-Shrink Grout
1. Non-shrink grout shall be used to seal openings in the manhole base and riser sections such as lift holes and around flexible sleeve connections as shown on the standard details. Non-shrink grout shall be MasterSeal 590 or approved equal.
 2. Surface preparation, mixing and application shall strictly adhere to manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL:

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

3.2 GRANULAR BASE:

- A. Remove standing water from excavation. Place 12-inches minimum of Alabama Department of Transportation #57 stone and compact with vibratory compaction equipment.
- B. Excavations deeper than 12-inches below required grade of manhole base, not approved by the Engineer, shall be filled with Alabama Department of Transportation No. 57 crushed limestone and compacted by vibratory compaction equipment at no additional cost to the Owner.

3.3 PLACING MANHOLE BASE AND SECTIONS:

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

3.4 MANHOLE INVERT:

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

3.5 MANHOLE FRAMES AND COVERS:

- A. Install manhole frames and covers with top surface adjoining surrounding grade in improved areas, or 18 inches above grade in unimproved areas. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted so as to conform to the exact slope, crown and grade of the existing pavement adjacent thereto. Set manhole frames at the required elevation in a full bed of grout for provide proper bonding to cone section and/or concrete adjusting rings.
- B. Where manhole frame elevation requires adjustment, precast concrete adjusting rings shall be used. A minimum 1/4-inch bed of non-shrinking grout shall be placed between the manhole cone section and the adjusting ring. Same grout thickness shall be provided in between adjusting rings when multiple rings are necessary. Butyl sealant waterstop shall be placed beneath the frame and in between each concrete adjusting ring as shown on the drawings. Butyl sealant shall be Con Seal CS-231.
- C. Manhole frame shall be positioned concentrically above the precast cone section or adjusting rings and set in a full bed of non-shrink grout. A thick ring of non-shrink grout extending to the outer edge of the precast cone section or adjusting ring shall be placed all around and on top of the manhole frame. The non-shrink grout shall be smoothly finished and have a slight slope to shed water away from the frame and cover.
- D. Check manhole cover for fit in frame. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or moves in the frame, the frame and cover shall be removed and replaced by the Contractor.

3.7 MANHOLE HEIGHT ADJUSTMENT:

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

3.8 PROTECTIVE COATINGS:

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

END OF SECTION 332607

SECTION 332614 – HIGH DENSITY POLYETHYLENE (HDPE) GRAVITY PIPE & FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

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

1.2 INSTALLATION

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

END OF SECTION 332614

SECTION 332622 – POLYVINYL CHLORIDE GRAVITY SEWER PIPE

PART 1 - GENERAL

1.1 Section Includes:

- A. This section of specifications covers the material requirements for polyvinyl chloride (PVC) pipe, fittings, and laterals for use in gravity sewer applications.
- B. The installation requirements for pipe specified under this section shall conform to Section 312250 – Trenching, Backfill and Compaction.
- C. The testing requirements for materials, in-place, specified under this section shall conform to Section 332722 – Sanitary Sewer System.

1.2 Related Sections:

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

1.3 References

- A. ASTM D1784, latest revision, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- B. ASTM D3034, latest revision, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- C. ASTM D2412, latest revision, External Properties of Plastic Pipe by Parallel Plate Loading.
- D. ASTM D3212, latest revision, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- E. ASTM F477, latest revision, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- F. ASTM D2321, latest revision, Standard Recommended Practice for Installation of Flexible Thermoplastic Sewer Pipe.
- G. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inches–12 inches, for Water Distribution.

1.4 Quality Control and Assurance:

- A. All pipe and fittings shall be inspected at the factory and on the job site. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions, or other defects. The pipe shall be as uniform in color as commercially practical. PVC pipe shall have a ring painted around the spigot ends in such a manner as to allow field checking of setting depth of pipe in the socket.
- B. PVC sewer pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, PVC cell classification or material code, dimension ratio or standard dimension ratio, and the nominal diameter. All PVC pipe shall be manufactured in the United States.
- C. All PVC pipe shall be new and unused and properly stored at the manufacturer to prevent degradation of the pipe due the exposure to sunlight and excessive heat.
- D. Pipe must be delivered to job site by means, which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by “egging” or crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe shall not be stored outside where subject to sunlight.
- E. Pipe which has been stored by the Contractor for three (3) months or longer shall not be acceptable.

PART 2 – MATERIALS

2.1 PVC Gravity Sewer:

- A. PVC gravity sewer pipe shall be made from compounds conforming to ASTM D1784. PVC pipe and fittings, 8 to 12 inches in diameter, shall conform to and be tested under all of the requirements of ASTM D3034. This designation specifies minimum requirements and test methods for materials, dimensions, workmanship, flattening resistance, impact resistance, pipe stiffness, extrusion quality, and pipe marking. PVC gravity sewer shall have a wall thickness equal to or greater than SDR 26.
- B. Minimum pipe stiffness ($F/ \Delta Y$) at 5 percent deflection shall be 115 for all sizes when calculated in accordance with ASTM D2412.
- C. PVC sewer pipe shall be supplied in standard lengths of at least 12 feet 6 inches. Longer lengths are permitted. PVC gravity sewer pipe shall be green in color.
- D. Fittings for service connections shall be of the factory made inline type conforming to the requirements of ASTM D3034 and shall have a wall thickness equal to or greater than SDR 26. Service connections shall be made with wye fittings. Saddle type fittings shall not be used.
- E. All pipe and fittings shall be joined by means of an integral wall bell and spigot with a flexible watertight elastomeric seal. Joint material and testing requirements shall conform to ASTM D3212 and ASTM F477.

2.2 PVC Laterals

- A. PVC service laterals for PVC sewer mains shall be of same material described in 2.01A above.
- B. PVC service laterals for ductile iron sewer mains shall be AWWA C-900 pipe and shall have a wall thickness equal to or greater than DR 25.
- C. Contractor shall provide an easily removable, watertight and airtight, gasketed plug at the end of the service lateral.

PART 3 – EXECUTION

3.1 PVC Gravity Sewer:

- A. In addition to the requirements for installation and testing specified in Section 332722 – Sanitary Sewer System, installation of PVC gravity sewer pipe shall conform to ASTM D2321 and manufacturer's recommendations unless otherwise amended in these Specifications.
- B. Trenching, backfill, and compaction shall conform to Section 312250 – Trenching, Backfill and Compaction of these Specifications.
- C. The inside of all bells and outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.
- D. Immediately before joining PVC pipe, the joining surfaces shall be completely coated by brushing with the lubricant sealer furnished by the pipe manufacturer. The spigot end shall then be centered to exact line and grade and then sealed by forcing the spigot into the bell in an approved manner.
- E. Pipe that has been field cut must be beveled for insertion into the gasketed joint. Bevel can be made with hand or power tool. In either case, the finished bevel should be the same as the factory bevel.

3.2 PVC Laterals

- A. In addition to the requirements for installation and testing specified in Section 332722 – Sanitary Sewer System, installation of PVC laterals pipe shall conform to ASTM D2321 and manufacturer's recommendations unless otherwise amended in these specifications. Connection between service lateral and sewer main shall be watertight. PVC service laterals shall be installed for each lot and extend from the collector sewer to user's property line.
- B. Trenching, backfill, and compaction shall conform to Section 312250 – Trenching, Backfill and Compaction of these Specifications.
- C. A PVC-coated electronic service marker shall be located six inches above the top of the lateral just beyond the curb.

END OF SECTION 332622

SECTION 332625 – POLYVINYL CHLORIDE WATER PIPE

PART 1 - GENERAL

1.1 Section Includes:

- A. This section of specifications covers materials and installation for PVC water pipe, Class 200, for pipe 2 inches or less and AWWA C900 for pipe 4 inches and larger.

1.2 Related Sections:

- A. Section 312250 - Trenching, Backfill and Compaction
- B. Section 332600 - Ductile Iron Pipe and Fittings
- C. Section 332660 - Water System

1.3 Unit Prices:

- A. PVC water pipe shall be paid for by the linear foot. Payment shall include all trenching, bedding, backfill, materials, labor and equipment.

1.4 References:

- A. ASTM D2241, ASTM Standard for Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
- B. ASTM D1784, Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compound.
- C. ASTM D2152, Test for Quality of Extruded Polyvinyl Chloride (PVC) Pipe by Acetone Immersion.

1.5 Submittals:

- A. The contractor shall submit to the Engineer in accordance with Section 013000 of these Specifications the following items:
 - 1. Product Data (catalog cuts, manufacturing data, etc).
 - 2. Manufacturer's certification as to compliance with all tests as outlined in ASTM D2241.
 - 3. Manufacturer's installation instructions.

1.6 Delivery, Storage And Handling:

- A. The contractor shall check all PVC piping for damage during shipment prior to unloading. All pipe shall be completely covered during transportation.
- B. The contractor shall rotate stored piping so that old piping is used first.
- C. All piping shall be handled with care to avoid damage to piping.
- D. Piping split, cracked or otherwise damaged shall be removed from the jobsite.

PART 2 - PRODUCTS

2.1 Materials:

- A. PVC water pipe shall conform to ASTM D1784 and be manufactured from PVC compounds that equal or exceed classes PVC 12454-B, PVC 12454-C, or PVC 14333-D as defined in ASTM D1784.
- B. Gaskets shall conform to ASTM D1869 for potable water and AWWA standards for fire lines.

2.2 Manufacture:

- A. All PVC water pipe shall be manufactured according to ASTM D1784.
- B. All PVC pipe shall be acetone tested in accordance with ASTM D2152.
- C. All PVC pipe shall withstand a hydrostatic pressure of 200 psi with a SDR of 21.
- D. All PVC water pipe shall be manufactured in the United States.
- E. All PVC pipe shall be marked in accordance with ASTM D2241 to indicate manufacturer's name, material designation code, nominal pipe size, SDR, pressure rating in psi for water at 73 degrees F., ASTM Designation D2241, and the National Sanitation Foundation Stamp of Approval for use in potable water systems.

2.3 Manufacturer's Testing:

- A. All PVC piping shall be subject to the sustained pressure test, burst pressure test and flattening test as defined in ASTM D2241.
- B. Test specimens shall come from the same lot and same manufacture run as the pipe being furnished.
- C. Certified copies of all test reports shall be submitted to the Engineer.

PART 3 - EXECUTION**3.1 Examination:**

- A. The contractor shall examine all piping and inspect for damage prior to pipe placement.
- B. The contractor shall examine the pipe trench for rocks, stones, and other objects that would damage the piping.

3.2 Installation:

- A. Trenching, backfill and compaction shall conform to Section 312250 of these specifications and to ASTM D 2774.
- B. The trench bottom shall be excavated for pipe bells.
- C. Pipe shall be inspected and all dirt and debris removed prior to joining.
- D. Spigot ends of pipe shall be cleaned and lubricated with lubricant supplied by the manufacturer.
- E. The spigot end shall be inserted into the bell end to the reference mark.
- F. Valves shall be installed according to Section 332662 of these specifications.
- G. A metallic tape or wire shall be installed in the same trench with all PVC pipe for use as pipe detection. Wire shall be 14-gauge TW solid copper. Wire shall be joined by wire nuts and connected to all valves to form a continuous circuit.
- H. Pipe shall be disinfected, flushed and tested in accordance with Section 332660 of these specifications.
- I. Thrust blocking shall conform with Section 332729 of these specifications.
- J. All taps shall be made using a double strap tap saddle.

END OF SECTION 332625

SECTION 332660 - WATER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

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

1.2 RELATED SECTIONS:

- A. Section 312250 - Trenching, Backfill and Compaction
- B. Section 332600 - Ductile Iron Pipe and Fittings
- C. Section 332625 - PVC Water Pipe
- D. Section 332662 - Resilient Seated Gate Valves
- E. Section 332664 - Valve Boxes and Vaults
- F. Section 332666 - Service Connections

1.3 REFERENCES:

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

1.4 SYSTEM REQUIREMENTS:

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

1.5 REGULATORY REQUIREMENTS:

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

1.6 SITE CONDITIONS:

- A. The Contractor shall familiarize himself with the existing conditions and special site requirements of the job.
- B. Any street cuts or crossings shall be coordinated with the Owner and/or Owner's Representative. Any and all traffic control measures specified shall be incorporated by the Contractor.
- C. Street cuts or crossings along or across State of Alabama Department of Transportation Right-of-Way shall follow the guidelines and requirements of the Alabama Manual on Uniform Traffic Control Devices.

- D. The Contractor shall contact the local water authority concerning the use of water to be used in the flushing, pressure testing, and disinfection.
- E. The Contractor shall take appropriate measures to control the disposal of water used in the testing, flushing and disinfection of water lines. The Contractor shall adequately protect streets and adjacent property from the discharge of this water. Any damages shall be borne by the Contractor. Water used for disinfection may contain high concentrations of chlorine. Any environmental damage to lakes or streams shall be the sole responsibility of the Contractor.
- F. The Contractor shall coordinate with the Architect and water works officials on the timing of all tests, flushing and disinfection of all water lines.
- G. The Contractor shall coordinate with the Architect and water works officials on all tie-ins to existing system lines and valves.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

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

2.2 EQUIPMENT AND MATERIALS:

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

2.3 TESTING EQUIPMENT:

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

PART 3 - EXECUTION

3.1 THRUST BLOCKING:

- A. All pressure pipes 2-inches in diameter and over shall be provided with thrust restraints. Thrust restraints shall consist of concrete thrust blocks and/or mechanical restraining rods and attachments shall be furnished at all hydrants, valves, fittings, plugs, and pipe bends.
- B. The bearing area for concrete thrust blocking shall conform to the tables shown on the standard details. Special blocking detailed in the drawings shall supercede these requirements.
- C. Concrete used in thrust blocking shall have a minimum compressive strength of 2000 psi in 28-days.
- D. The concrete blocking shall be placed in such a way to contain the thrust force and still maintain accessibility of the pipe and fittings for repair. Nuts, bolts, glands, etc. shall be free of concrete. No separate payment shall be made for concrete blocking or thrust restraint.
- E. Fire hydrants shall be restrained as detailed on the drawings.
- F. All restraining rods, clamps, and accessories shall be coated with a bitumastic coating before and after installation. The surface shall be cleaned thoroughly and the bitumastic coating applied as per manufacturer's recommendations.

3.2 TESTING:**A. Flushing:**

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

B. Hydrostatic Pressure Test:

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

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

L = Leakage in gallons per hour

S = Length of tested pipe (ft.)

D = Diameter of pipe (in.)

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

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

C. Disinfection:

1. After a successful pressure test has been achieved, the waterline shall be chlorinated for the purpose of disinfection.
2. The Contractor shall use the hypochlorite continuous feed method for chlorine application as specified in AWWA Standard C651.
3. Chlorine solution shall be introduced to achieve a concentration of at least 50 mg/l in all parts of the line.
4. The chlorine solution shall be allowed to remain in the pipe for a period of not less than 24-hours at which time the chlorine concentration shall be not less than 25 mg/l.

5. All pipe and appurtenances shall be flushed with clean water until the chlorine residual is reduced to 1 mg/l or less until compatible with the existing system. The Contractor shall not flush any lines unless the local Water Department is present.
6. Bacteriological samples shall be collected in sterile jars by the Contractor.
7. The Contractor shall perform the water analysis and provide results and/or reports to the Owner and Owner's Representative for review and final approval by the local water authority. All costs associated with the disinfection shall be borne by the Contractor, except sample collection and analysis for one set of sampling which shall be paid for by the Owner.
8. The water line and appurtenances shall not be placed in service until an acceptable laboratory analysis has been completed.
9. If the initial disinfection fails to produce satisfactory samples, disinfection as required above shall be repeated by the Contractor at his expense until satisfactory samples have been obtained.

3.3 EXISTING UTILITY CROSSINGS:

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

3.4 PROTECTION:

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

END OF SECTION 332660

SECTION 332662 – RESILIENT SEATED GATE VALVES

PART 1 - GENERAL

1.1 SUMMARY:

- A. This section covers materials, installation and performance criteria for resilient seated gate valves, including tapping valves and sleeves, to be used in water and sewer service.

1.2 RELATED SECTIONS:

- A. Section 312250 - Trenching, Backfill and Compaction.
- B. Section 332664 - Valve Boxes and Vaults.

1.3 UNIT PRICES:

- A. Gate Valves shall be paid for per each, if a bid item is denoted in the Bid Schedule. If a specific bid item is not denoted in the Bid Schedule, payment for resilient seated gate valves shall be included in the stated lump sum bid amount. Payment, in either case, shall be based on a complete, installed and operable valve with valve box and concrete support considered incidental to the installation of gate valve. This payment shall include compensation for all appurtenances, materials, labor, etc. necessary to complete the work.
- B. Hot Tap with Tapping Valve and Sleeve shall be paid for per each, if a bid item is denoted in the Bid Schedule. If a specific bid item is not denoted in the Bid Schedule, payment for Hot Tap with Tapping Valve and Sleeve shall be included in the stated lump sum bid amount. Payment, in either case, shall be based on a complete, installed operable tapping valve with sleeve, valve box and concrete support considered incidental to the installation of gate valves. This payment shall include compensation for all appurtenances, materials, labor, etc. necessary to complete the work.

1.4 REFERENCES:

- A. AWWA C509 American Water Works Standards for Resilient Seated Gate Valves for Water Supply Service.
- B. AWWA C515 American Water Works Standards for Reduced-Wall Resilient Seated Gate Valves for Water Supply Service.
- C. AWWA C550 American Water Works Standards for Protective Epoxy Interior Coatings for Valves and Hydrants.
- D. AWWA C600 American Water Works Association Standard for Installation of Ductile-Iron Water Main and their appurtenances.

1.5 SUBMITTALS:

- A. The contractor shall furnish detail assembly drawings, specifications, catalog data and dimensions, and 5 sets of operating instructions for all gate valves.

1.6 QUALITY ASSURANCE:

- A. The contractor shall supply to the engineer an affidavit from the manufacturer that all gate valves 2-inches and larger conform to AWWA C509 or AWWA C515 and that all tests specified therein have been performed and all test requirements have been met.
- B. The contractor shall supply to the Engineer an affidavit of compliance from the manufacturer that all gate valves smaller than 2-inches conform to Federal Specification WW-V-54 and have a pressure rating of 200 psi minimum.

1.7 DELIVERY, STORAGE AND HANDLING:

- A. Packing and Shipping:
 - 1. Markings shall be cast on the bonnet or body of each valve conforming to AWWA C509 or AWWA C515.
 - 2. Valves shall be packaged for shipment to avoid damage during shipping and handling. All gate valves shall be completely drained and closed prior to shipment.
- B. Acceptance at Site:
 - 1. Gate valves shall be thoroughly checked at the site prior to unloading. Any valves found defective or damaged during shipment will be rejected.
 - 2. The contractor shall provide adequate lifting equipment to unload large valves. In no case should valves be dropped.
 - 3. Chains, hoists or other lifting devices should not be fastened around bypasses, yokes, gearing, motors, stems or handwheels. Valves shall not be lifted by the stem.
- C. Storage and Protection:
 - 1. Valves should be stored in a closed position and protected from rain, dirt and debris by covering or storing indoors. In freezing weather, the contractor shall take steps to assure valves do not freeze.
 - 2. Rubber gaskets for joints shall be stored in a cool, dry place out of direct sunlight. Avoid contact between petroleum based substances and rubber gaskets.
 - 3. Gate valves shall be stored such that the resilient coating on the interior of each valve is not exposed to direct sunlight for extended periods of time. In addition, each valve shall be stored to avoid exposing the epoxy interior coating to nicks and abrasions.

1.8 SCHEDULING:

- A. The contractor shall schedule deliveries of gate valves to assure the proper materials are on hand prior to the installation of the work.

PART 2 - PRODUCTS**2.1 APPROVED MANUFACTURERS:**

- A. American Darling Valve Company.
- B. Clow.
- C. Mueller.
- D. M & H

2.2 EQUIPMENT:

- A. Gate valves 4-inches through 12-inches:
 - 1. Gate valves shall conform to AWWA C509 or AWWA C515.
 - 2. Gate valves shall be iron-bodied, resilient wedge unless otherwise noted.
 - 3. Operating nuts shall be 2-inch in size and operate counter clockwise to open the valve.
 - 4. Gate valves shall be mechanical joint if buried and flange joint if located inside or attached to structures. Retainer glands shall be used with mechanical joints unless otherwise specified.
 - 5. Valves shall be non-rising stem type, unless specifically denoted otherwise.
 - 6. The interior coating shall be fusion bonded epoxy conforming to AWWA C550.
 - 7. The iron valve body shall be hydrostatically tested to 500 psig and the completed valve shall be bubble tight to 250 psig.

- B. Gate Valves 2-inch and smaller:
1. Gate valves shall be bronze, Stockham B103, or equal.
 2. Gate valves shall conform to Federal Specification WW-V-54, Class 150.
 3. Gate valves to have non-rising stem - inside screw type solid wedge disc.
 4. Gate valve body, bonnet and disc to be bronze, meeting ASTM Specifications B-62.
 5. Packing nut and stuffing box to be bronze, meeting ASTM Specifications B-584.
 6. Packing gland to be brass.
 7. Handwheel to be malleable iron, meeting ASTM Specifications A-197.
 8. Handwheel nut to be steel.
 9. Full port opening - disc to recess completely into bonnet.
 10. Packing to be non-asbestos Kevlar with Teflon.
- C. Gate Valves 14-inch through 48-inch:
1. In general, resilient seated gate valves, 14-inch through 48-inch shall conform to the requirements for resilient seated gate valves 4-inches through 12-inches except for the requirements denoted below:
 - a. Unless denoted otherwise the operating stem shall be horizontal.
 - b. The operating nut shall operate a fully enclosed gear drive to operate the valve stem and open and close the valve.
 - c. Gears shall be smooth running, accurately cut and made from ASTM A26 Grade U-60-30 steel.
 - d. Gear ratios shall conform to Table 7 of AWWA C500.
 - e. Fully enclosed gear cases designed for underground use shall be provided.
 - f. The iron body shall be hydrostatically tested to 400 psig and the completed valve assembly shall be bubble tight at 200 psig.
 2. Bypasses shall be provided for all valves 24-inches and larger.
 - a. Bypass sizing shall conform to Table 8 of AWWA C500.
 - b. Valves used for bypasses shall be non-rising stem gate valves of the same size as specified in Table 8 above.
 - c. Valves used for bypass shall conform to these specifications.
 - d. Piping used in bypasses shall be ductile-iron, mechanical joint conforming to Section 332600, Ductile Iron Pipe and Fittings.
- D. Tapping Valve and Sleeve:
1. All tapping Valves shall comply with AWWA Specifications C-509 for resilient seat valves and the following design specifications:
 - a. All tapping valves are to be non-rising stem; open left.
 - b. Tapping valves 12 inch and smaller have a working pressure of 200 psig and tested at 400 psig and tap valves 14" and larger shall have a working pressure of 150 psig and test pressure of 300 psig.
 - c. All tapping valves must be furnished with "O" Ring seals.
 - d. Tapping valves shall have an outlet end connection of the mechanical joint type. Inlet ends shall have an inlet flange for the attaching to a sleeve or cross. A machine projection on this flange shall be made with a machined recess in the tapping sleeve outlet flange to assure correct alignment.
 - e. Seat opening of tapping valves shall be larger than the nominal size to permit full diameter cuts to be made.
 - f. All valves to have tap sleeve ends complete with bolts, glands and 1/8" thick rubber gaskets.
 2. Tapping sleeves shall be suitable for use on pipe with AWWA specifications C102-53, C105-53, C108-53 and the following design specifications:
 - a. Tapping sleeves shall be of the mechanical joint type. The mechanical joint ends shall be sealed by neoprene gaskets, compressed tightly around mains by means of a second flange or gland bolted to the end flange of the sleeve. Gasket and its seat inside the end flange or the sleeve shall be tapered or wedge shaped. The gasket shall be totally confined to prevent cold-flow when gland is tightened.

- b. Tapping sleeves shall have a working pressure of 200 psig.
- c. The side outlet or branch connection outlet shall be machined and with a machined recess match the machined projection of the tapping valve flange to assure correct alignment.
- d. The longitudinal or side gaskets shall be of neoprene and shall be confined in a cored groove.

2.3 FABRICATION:

- A. Valves shall be fabricated and assembled to be well fitted and to operate smoothly.
- B. Parts shall be designed and manufactured to be interchangeable between manufacturers of the same type and size.
- C. Castings shall be sound and free from defects.

2.4 SOURCE QUALITY CONTROL:

- A. Each gate valve shall be subjected to an operation test and hydrostatic test at the place of manufacture.
- B. The contractor shall supply to the Engineer an affidavit of compliance as specified in 1.06.A and B of these specifications.
- C. Operation and hydrostatic testing shall conform to applicable section of AWWA C509 or AWWA C515.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Prior to the installation of the gate valve, the valve should be examined and inspected for compliance with these specifications and proper operation.
- B. Valves that fail to comply with these specifications or operate properly shall be removed from the jobsite without compensation.
- C. All gate valves shall be operated through one complete cycle by the Contractor in the presence of the Engineer to verify proper operation.

3.2 PREPARATION:

- A. Prior to installation of the valve, the contractor shall prepare the area for valve installation by supporting the associated piping to align the valve.
- B. The contractor shall determine that proper materials are on hand for a complete valve installation.
- C. The contractor shall review the manufacturer's installation instructions to ascertain that no unusual installation procedures are required. Should the contractor find any unusual procedures, he shall promptly report them to the Engineer.

3.3 INSTALLATION:

- A. All gate valves installed underground shall be installed in a closed position.
- B. Gate valves shall be installed on a firm footing and temporarily supported until a permanent support can be poured. Pipe ends should be supported to minimize bending to the valve end connections.
- C. A valve box or vault shall be installed around all gate valves. The contractor shall refer to the drawings for any special vaults to be constructed. If no special vault is specified a valve box shall be installed.

- D. Valve boxes and vaults shall be installed to avoid traffic and other surface loading being transmitted to the valve.
- E. Valve boxes shall be centered over the operating nut with the top flush with the surrounding finished elevations.
- F. Large valves installed with bypasses shall have a second valve box installed, centered over the smaller bypass valve operating nut.
- G. Valves installed in deep trenches with the operating nut located six feet below the finished surface shall have stem risers provided for operation with a six-foot key.
- H. Gate valves installed above ground shall be supported to avoid excessive stress and bending to the valve end connections.

3.4 FIELD QUALITY CONTROL:

- A. After installation, but prior to pressure testing, all bolts shall be checked with a torque wrench for proper torque.
- B. Gate valves shall be left uncovered during hydrostatic testing to check for leaks unless test pressures are great enough to cause unstable conditions at the valve.
- C. Gate valves shall not be tested at pressures greater than twice the rated working pressure of the valve.

3.5 RECORDS:

- A. The contractor shall sufficiently mark all gate valve locations and record the size, make, date of installation, and number of turns necessary to open. The contractor shall furnish the Engineer with 3 copies of such records.

3.6 PROTECTION:

- A. The contractor shall protect all gate valves from damage until final acceptance of the work.

END OF SECTION 332662

SECTION 332664 - VALVE BOXES AND VAULTS

PART 1 - GENERAL

1.1 SUMMARY:

- A. This section of specifications covers materials, installation and other incidentals pertaining to valve boxes and vaults installed around valves.

1.2 RELATED SECTIONS:

- A. Section 312250 – Trenching, Backfill, and Compaction
- B. Section 332660 – Water System
- C. Section 332662 – Gate Valves
- D. Section 332666 – Service Connections

1.3 OMIT

1.4 SUBMITTALS:

- A. Valve Boxes:
 - 1. The Contractor shall submit product data including catalog cuts, manufacturer's data and other incidental information on valve boxes.
- B. Vaults:
 - 1. The Contractor shall submit shop drawings to be approved prior to the manufacturer of all lids and covers to be installed over vaults.

1.5 QUALITY ASSURANCE:

- A. Valve Boxes:
 - 1. Valve boxes shall be cast by a foundry with at least five years experience in the casting of valve boxes and covers.
- B. Vaults:
 - 1. Vaults shall be built according to detail drawings specified in the drawings. The Contractor shall construct the vaults in a neat and workmanlike manner.
 - 2. Vault covers shall be fabricated according to the detail drawings and shop drawings approved by the Architect. Vault covers shall be fabricated in a neat and workmanlike manner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Clow Corporation, Model No. F-2452
- B. Opelika Foundry
- C. Acheson Foundry
- D. Mueller Company, Model No. E-2702

2.2 MATERIALS:

- A. Valve Boxes and Covers:
 - 1. Valve boxes and covers shall be of cast-iron manufactured as a unit with all associated extensions and bases.
 - 2. Valve boxes shall be 2 piece, screw type, with a 5-1/4" shaft.
 - 3. Covers for valve boxes on potable water lines shall have the word "WATER" cast onto the cover. Covers for sewage valves, sludge valves, and non-potable water valves shall have the word "SEWER" cast onto the cover. Covers for natural or manufactured gas valves shall have the word "GAS" cast onto the cover.

- B. Vaults:
 - 1. Vaults shall be constructed of reinforced concrete as shown on the Drawings.
 - 2. Vault covers shall be constructed of steel plate and angles as detailed on the drawings or of manufactured supplied items as specified on the Drawings. Steel shall be A 36, shop primed, and painted. Color shall be selected by the Owner.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Valve boxes shall be inspected prior to installation for any defects, cracks, and that all necessary parts are on hand.

3.2 INSTALLATION:

- A. Valve Boxes:
 - 1. Valve boxes shall be installed plumb, centered over the operating nut on a firm and compacted base and carefully and thoroughly backfilled.
 - 2. Valve boxes shall be installed so as to not induce stress to the valve.
 - 3. Valve boxes shall be installed with the top no more than 1/2-inch above finished grade. Valve boxes shall be installed with the top of the box flush with finished paving.

3.3 PROTECTION:

- A. Valve boxes and vaults shall be protected from damage until final acceptance of the work.
- B. Any valve box or vault damaged prior to final acceptance of the work shall be removed and replaced with all costs borne by the Contractor.

END OF SECTION 332664

SECTION 332666 - SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. This Section of Specifications covers materials and installation requirements for the construction of a service line from a water meter to building.

1.2 RELATED SECTIONS:

- A. Section 312250 - Trenching, Backfill and Compaction
- B. Section 332660 - Water System

1.3 REFERENCES:

- A. AWWA C800 AWWA Standard for Underground Service Lines, Valves and Fittings.
- B. ANSI B.1.1 American National Standard for Unified Inch Screw Threads.
- C. ANSI B.1.20.3 Dry Seal Pipe Threads.
- D. ASTM B88 ASTM Standard for Seamless Copper Water Tube.
- E. ASTM B584 ASTM Standard for Copper Alloy Sand Castings for General Applications.

1.4 SUBMITTALS:

- A. The Contractor shall submit in accordance with Section 013000 the following items:
 - 1. Product data including catalog cuts and manufacturing data.
 - 2. Test reports as outlined in Section 3 of AWWA C800.
 - 3. Manufacturer's Affidavit of Compliance with AWWA C800.

1.5 QUALITY ASSURANCE:

- A. The Contractor shall comply with all local, state and federal codes, requirements and regulations.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. The manufacturer's name or trademark shall be cast on the bodies of all valves and fittings.
- B. The Contractor shall thoroughly inspect all valves, fittings and service lines for damage and defects prior to and again after installation.
- C. The Contractor shall store all service lines, valves and fittings in a clean, dry area and protect same from freezing and other damages.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Valve and Fitting Castings shall be made from Copper Alloy No. C83600 in accordance with ASTM B62 or ASTM B584.
- B. Seals, threads, and packing shall be of materials recommended by the manufacturer that are compatible with the valve or fitting.
- C. Service Line:
 - 1. All service lines shall be Type "K" soft copper.

2.2 FABRICATION:

- A. All service line valves and fittings shall conform to AWWA C800 and shall be manufactured to be first class in every respect.
- B. Valves and fittings shall be free of metal chips, filings and excess lubricants.
- C. Castings shall be clear and sound without defects.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Service lines shall run in the shortest and straightest possible course from the water main to the meter installation and from the meter installation to the building.
- B. See Construction Plans for jumbo standard meter boxes, larger meter boxes, and detector vaults. Note, there shall be no additional pay for installation of a vault versus a meter box.

END OF SECTION 332666

SECTION 332668 - FIRE HYDRANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. This specification covers material and installation specifications for fire hydrants and related accessories.

1.2 RELATED SECTIONS:

- A. Section 312250 - Trenching, Backfill and Compaction
- B. Section 332600 - Ductile Iron Pipe and Fittings
- C. Section 332660 - Water System
- D. Section 332662 - Gate Valves
- E. Section 332664 - Valve Boxes and Vaults

1.3 OMIT

1.4 REFERENCES:

- A. AWWA C502, AWWA Standard for Dry Barrel Fire Hydrants.
- B. AWWA C600, AWWA Standard for Installation of Ductile-Iron Water Mains and Appurtenances.

1.5 SUBMITTALS:

- A. The contractor shall submit to the Engineer in accordance with Section 013000 of these specifications the following items:
 - 1. Design data showing the loss of head and how this test was conducted.
 - 2. Test reports of the mechanical test and hydrostatic test as defined in Section 5 of AWWA C502.
 - 3. Product Data.
 - 4. Manufacturer's Affidavit of Compliance According to Section 5.4 of AWWA C502.
- B. The manufacturing process and testing shall be open to and subject to inspection and observation by the Owner's representative.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Hydrants shall be complete with all required accessories when shipped. The manufacturer shall prepare hydrants so that they will not be damaged during shipment. Hydrants shall be completely drained and closed prior to shipment.
- B. The contractor shall use extreme care when unloading hydrants. Hydrants shall be inspected prior to unloading and checked for damage during shipment. Any hydrant damaged during this unloading or shipping process shall be rejected and removed from the job.
- C. The contractor shall provide a dry, suitable area for storage of hydrants. Hydrants shall be protected from freezing and other damages during storage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. American-Darling Valve - Mark 73
- B. Mulleur Company - Centurion
- C. M & H - Model 129
- D. Clow Valve Company - Medallion
- E. U S Pipe Company - Metropolitan 250 M-94

2.2 MANUFACTURED UNITS:

- A. All fire hydrants shall consist of a hydrant, gate valve, ductile iron spools and associated accessories and be considered as a unit.
 - 1. Hydrant:
 - a. Fire hydrants shall conform to AWWA C502.
 - b. Fire hydrants shall have a working pressure of 150 psi and be tested at 300 psi.
 - c. Fire hydrants shall have a 4-1/2-inch minimum valve opening.
 - d. Fire hydrants shall be equipped with two 2-1/2-inch nozzles (thread MDZGA N5) and one 4-1/2-inch nozzle (thread MDZGA 4-556).
 - e. Fire hydrants shall open counter clockwise and be equipped with a 1-1/2-inch bronze pentagonal operating nut.
 - f. Fire hydrants shall be equipped with a 6-inch mechanical joint or flange joint shoe complete with gland and rubber gaskets.
 - g. Fire hydrants shall be equipped with a break away safety flange, brass safety stem coupling and brass safety sleeve.
 - h. Fire hydrants shall be equipped with double drain valves and double drain openings, "O" ring seals, bronze seat ring with compression type main valve, an oil filled reservoir and a positive stop stem.
 - i. Nozzle caps shall be provided with non-kinking chains.
 - j. All fire hydrants shall be manufactured in the United States.
 - 2. Gate Valves shall comply with Section 332662 of these specifications.
 - 3. Ductile iron spools shall comply with Section 332600 of these specifications.

2.3 PAINTING:

- A. Fire hydrant interiors shall be painted to conform with AWWA C502.
- B. Fire hydrant exteriors shall be painted to conform with AWWA C502 and in addition shall be painted with red enamel.

2.4 MANUFACTURER'S TEST:

- A. Fire hydrants shall be subjected to the mechanical test and hydrostatic tests as outlined in Section 5 of AWWA C502.
- B. Copies of these tests shall be furnished to the Engineer.

PART 3 - EXECUTION**3.1 EXAMINATION:**

- A. All fire hydrants shall be inspected prior to installation for direction of opening, operating nut dimensions, tightness of all bolts, cleanliness of inlet and all defects or damage during shipping and handling.
- B. Defective hydrants shall be removed from the jobsite.

3.2 INSTALLATION:

- A. Fire hydrants shall be installed as shown on the plans or directed by the Engineer.
- B. All hydrants shall be installed plumb with the 4-1/2 inch pumper nozzle facing the street or alley.
- C. Fire hydrants where placed behind curbing shall be set back a sufficient distance to avoid car bumpers as the cars pull to the curb. Fire hydrants shall be placed 2-feet from side walks and parkways to provide safety for pedestrians.
- D. Hydrants shall be set with the breakaway flange not less than 2-inches or more than 6-inches above finished grade.
- E. Fire hydrants shall be connected to a supply line 6-inches in diameter or larger.
- F. Fire hydrants shall be installed with a gate valve and box located a sufficient distance away from the hydrant to allow for hydrant maintenance.
- G. A drainage pit 2-feet x 2-feet x 2-feet shall be excavated below the hydrant and filled with coarse graded stone or gravel to 6-inches above the hydrant opening. The drainage pit shall not be connected to or be near any sewer.
- H. Hydrants shall be anchored by thrust blocking and tie rods. Tie rods shall be installed from the hydrant to the main. All tie rods and accessories shall be coated with tar.
- I. All hydrants shall be carefully and thoroughly backfilled.

3.3 CLEANING AND PROTECTION:

- A. The contractor shall clean the area of any construction debris, excess backfill and other items.
- B. The contractor shall carefully check hydrant for proper operation in the presence of the Engineer.
- C. The contractor shall maintain hydrants from damage until final acceptance of the work.

END OF SECTION 332668

SECTION 332670 - BACKFLOW PREVENTION

PART 1 - GENERAL

1.1 Section Includes:

- A. This Section of Specifications covers the material and installation requirements for backflow prevention devices.

1.2 Related Sections:

- A. Section 312250 - Trenching, Backfill and Compaction
- B. Section 332600 - Ductile Iron Pipe and Fittings
- C. Section 332660 - Water System
- D. Section 332666 - Service Connection

1.3 References:

- A. AWWA C506 AWWA Standards for Backflow Prevention Devices. Reduced Pressure Principle and Double Check Valve Types.
- B. ANSI/ASSE Spec. No. 1024

1.4 Submittals:

- A. The Contractor shall submit, in accordance with Section 013000 of these specifications, product data including catalog cuts, test reports, manufacturer's installation instructions and the manufacturer's certificate of compliance with AWWA C506.

1.5 Quality Assurance:

- A. Backflow prevention devices shall be tested by a laboratory recognized as having expertise in testing backflow prevention devices as required in Section 1.3 of AWWA C506 Specifications. The laboratory shall be acceptable to the Owner.

1.6 Delivery, Storage and Handling:

- A. The manufacturer shall prepare each backflow prevention device for shipment so that no damage will occur during shipment.
- B. All backflow preventers shall be complete in every respect and completely drained with all openings closed prior to shipment.
- C. Upon receipt, the Contractor shall thoroughly examine backflow preventers for damage during shipment and store them in a clean, dry and safe area.

PART 2 - PRODUCTS

2.1 Materials:

- A. Because of the threat of electrolysis, when differing metals are used, insulation and/or electrolytically similar metals shall be used throughout the construction.
- B. Residential dual check valve preventers:
 - 1. Residential dual check valve preventers shall be bronze bodied, with two acetyl resin plastic check modules, BUNA "N" Seals, stainless steel springs, and "O" ring union seals. The dual check valve preventers shall be Watts No. 7 or an approved equal. All residential dual check valve preventers shall be 3/4 inch or larger.

- C. Commercial Double Check Valve and Reduced Pressure Zone Backflow Preventers:
 - 1. Valve bodies, covers, spools and spacers shall be ASTM B61, Bronze, or ASTM A126, Class B, Gray Iron.
 - 2. Clapper and Poppett Facing Rings shall be molded synthetic rubber with a shore durometer hardness of 35 to 45.
 - 3. Relief Valve Facing Rings shall be molded synthetic rubber with a shore durometer hardness of 60 to 70.
 - 4. Swing Pin and Guide Stems shall be ASTM B139, Grade A, C or D Phosphor Bronze or ASTM A 276, Type 304, Stainless Steel.
 - 5. Springs shall be ASTM A313 Steel or ASTM B159 Phosphor Bronze.
 - 6. Diaphragms shall be synthetic rubber with a cotton or rayon insert conforming to Federal Specification HHP-151B.
 - 7. Seat Rings and Valve Seats shall be ASTM B61 Bronze or ASTM A276, Type 304, Stainless Steel.

2.2 Manufactured Unit:

- A. Backflow Preventers shall be manufactured as a unit capable of operating at a supply pressure of 150 psi and a temperature of 140-degrees F.
- B. Residential dual check valve backflow preventers shall meet or exceed ANSI/ASSE Standard 1024.
- C. Double check valve and reduced pressure zone backflow preventers shall meet or exceed AWWA C506 Specification.

2.3 Fabrication:

- A. All foundry and machine work shall be first class, free of injurious defects and conform to the manufacturer's tolerances.
- B. Flange joints shall be faced true and machined at right angles to their respective axes. Threaded joints shall be concentric and accurately cut free of burrs.
- C. All joints shall be tested as watertight when subjected to the design pressure.

PART 3 - EXECUTION

3.1 Examination:

- A. The Contractor shall examine all backflow preventers for damage prior to installation.

3.2 Installation:

- A. All backflow preventers shall be installed on the consumer side of the meter.
- B. Small residential backflow preventers shall be installed in the water meter box.
- C. Backflow preventers greater than 2" in diameter, shall be installed as shown on the Drawings.
- D. All backflow preventers shall be installed with no leakage around any joint.
- E. Backflow preventers greater than 2" in diameter shall have blocking castings under them so that their weight is not supported by the adjacent piping.

END OF SECTION 332670

SECTION 332672 – WATER SERVICE RELOCATION

PART 1 - GENERAL

1.1 Section Includes:

- A. This Section of Specifications covers materials and installation requirements for the relocation of a service line from an existing water main to a proposed water main and/or relocating an existing water meter assembly.

1.2 Related Sections:

- A. Section 312250 - Trenching, Backfill and Compaction
- B. Section 332660 - Water System
- C. Section 332664 - Valve Box and Vaults

1.3 References:

- A. AWWA C800 AWWA Standard for Underground Service Lines, Valves and Fittings.
- B. ANSI B.1.1 American National Standard for Unified Inch Screw Threads.
- C. ANSI B.1.20.3 Dry Seal Pipe Threads.
- D. ASTM B88 ASTM Standard for Seamless Copper Water Tube.
- E. ASTM B584 ASTM Standard for Copper Alloy Sand Castings for General Applications.

1.4 Submittals:

- A. The Contractor shall submit in accordance with Section 013000 the following items:
 - 1. Product data including catalog cuts and manufacturing data.
 - 2. Test reports as outlined in Section 3 of AWWA C800.
 - 3. Manufacturer's Affidavit of Compliance with AWWA C800.

1.5 Quality Assurance:

- A. The Contractor shall comply with all local, state and federal codes, requirements and regulations.
- B. Prior to beginning the work specified in this section, the Contractor shall schedule a coordination meeting with the water system Owner to review the installation procedures for the water service connections.

1.6 Delivery, Storage and Handling:

- A. The manufacturer's name or trademark shall be cast on the bodies of all valves and fittings.
- B. The Contractor shall thoroughly inspect all valves, fittings and service lines for damage and defects prior to and again after installation.
- C. The Contractor shall store all service lines, valves and fittings in a clean, dry area and protect same from freezing and other damages.

PART 2 - PRODUCTS

2.1 Materials:

A. Corporation Stops

- 1. All components of the corporation stops shall be manufactured of certified ingot, conforming to AWWA C-800.
- 2. Seals, threads, and packing shall be of materials recommended by the manufacturer that are compatible with the valve.
- 3. The stem and retaining nut shall be so designed that failure from over-tightening of the nut results in thread stripping rather than stem fracture.
- 4. Corporation stops shall be of a 300 psi rating.
- 5. Corporation stops shall have compression nut with gripper ring and gasket providing a watertight seal by compressing of gasket around tubing and compressing the gripper ring providing high pull out resistance.
- 6. Compression nuts requiring a split type clamp with screw or bolt will not be accepted.
- 7. Corporation Stops shall be ball valve type.

8. ALL CORPORATION STOPS TO BE FULL PORT OPENING.

B. Curb Stops

- 1. All components of the corporation stops shall be manufactured of certified ingot, conforming to AWWA C-800.
- 2. Seals, threads, and packing shall be of materials recommended by the manufacturer that are compatible with the valve.
- 3. Curb Valves shall be of the closed bottom design and sealed against external leakage at the top and port by utilizing non-adjustable resilient seals. Shut off shall be affected by a resilient pressure-actuated seal placed in the key or plug as to completely enclose the inlet port flow way in the closed position.
- 4. All curb valves shall have the open/closed positions controlled by check lugs which are integral parts of the key and the body.
- 5. Curb stops shall be of a 300 psi rating.
- 6. Curb stops shall have compression nut with gripper ring and gasket providing a watertight seal by compressing of gasket around tubing and compressing the gripper ring providing high pull out resistance.
- 7. Compression nuts requiring a split type clamp with screw or bolt will not be accepted.
- 8. Valves for the respective installation(s) must have the following laying lengths to facilitate change-outs at a minimum of cost and time:

a.	FIP x FIP VALVES	SIZE	LENGTH (IN.)
		3/4"	3.21" ± 0.0625
		1"	3.96" ± 0.0625
b.	COMPRESSION X FIP	SIZE	LENGTH (IN.)
		3/4"	3.84" ± 0.0625
		1"	4.35" ± 0.0625

9. Curb Stops shall be ball valve type with Lock Wing.

10. **ALL CURB STOPS TO BE FULL PORT OPENING.
(3/4" X 3/4" X 3/4") AND (1" X 1" X 1")**

C. Fittings

1. Valve and Fitting Castings shall be made from Copper Alloy No. C83600 in accordance with ASTM B62 or ASTM B584.
2. Seals, threads, and packing shall be of materials recommended by the manufacturer that are compatible with the valve or fitting
3. Fittings shall be suitable for use with water 100 degrees F and 150 psig minimum.

D. Water Service Line

1. All service lines shall be Type "K" soft copper, continuous in one piece, from the water main to the water meter.
2. Where relocation of an existing water service line is required, any existing services **NOT** constructed of Type "K" soft copper shall be replaced from the new water main to the existing water meter.

E. Water Meters and Meter boxes

1. Existing water meters shall **NOT** be replaced. Contractor shall take care to protect the meter during construction to prevent damage.
2. Existing meter boxes shall be relocated and replaced per the construction plans and details.

2.2 Fabrication:

- A. All service line valves and fittings shall conform to AWWA C800 and shall be manufactured to be first class in every respect.
- B. Valves and fittings shall be free of metal chips, filings and excess lubricants.
- C. Castings shall be clear and sound without defects.

PART 3 - EXECUTION

3.1 Installation:

- A. Service lines shall run in the shortest and straightest possible course from the water main installation to the water meter location.
- B. All water services installed on PVC mains shall have a double strap service saddle installed on the PVC water main to house the corporation stop.
- A. Water services installed on ductile iron mains may be tapped directly and the corporation stop installed directly to the ductile iron water main.
- B. Locations of all corporation stops for water services shall be physically located from at least two different locations of permanently fixed structures such as fire hydrants, power poles, etc. and indicated on the record drawings.

END OF SECTION 332672

SECTION 332722 - SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

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

1.2 RELATED SECTIONS:

- A. Section 312250 – Trenching, Backfill and Compaction
- B. Section 332600 – Ductile Iron Pipe and Fittings
- C. Section 332622 – PVC Gravity Sewer Pipe

PART 2 – PRODUCTS

2.1 GENERAL:

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

2.2 MATERIALS:

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

PART 3 – INSTALLATION

3.1 GRAVITY SEWER PIPE LAYING - GENERAL:

- A. Before sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared and the necessary bracing and sheeting installed.
- B. Unless noted otherwise on the drawings, all gravity sewer lines shall be installed with a minimum thirty-six (36) inches of cover.
- C. A properly designed and operated laser beam device may be used to align and grade the pipe. Laser beam devices used shall be carefully calibrated at intervals not to exceed 30 calendar days.
- D. Air blowers must be used in conjunction with laser beam devices and must be sufficient to provide an air flow through the pipe of 4 to 6 mph.

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

3.2 LATERALS INSTALLATION:

- A. Wye shall be installed in sanitary sewer lines at all points shown on the plans or specified herein. If such branches are not to be used immediately, they shall be closed with gasketed plugs specifically designed for such purpose.
- B. If the work consists of the construction of a sewer that is to replace an existing sewer, all of the existing service lines shall be connected to the new line.
- C. Wyes shall be installed in sanitary sewers so as to properly serve each existing house and each vacant lot facing or abutting on the street or alley in which the sewer is being laid, and at such other locations as may be designated by the Engineer. The exact location of each connection shall be determined by the Engineer before backfilling.
- D. Should ductile pipe lining be scratched, chipped, or otherwise damaged during the tapping process, it shall be properly repaired or recoated by the Contractor.
- E. Laterals shall be bedded and backfilled according to Section 312250 – Trenching, Backfill, and Compaction.
- F. Where the depth of cut is over 8 feet or where the grade of a sanitary sewer is lower than necessary to drain abutting property, and when designated by the Engineer, connecting risers shall be installed to serve each existing house and each vacant lot facing or abutting on the street in which the sewer is being laid.

- G. Connecting risers shall be either 4 or 6 inches in diameter installed from a wye connection to the elevation designated by the Engineer. The wye or tee connection shall be securely supported by a block of concrete, as shown on the drawings, to support the riser pipe. Open ends of connecting risers shall be closed, as herein before specified for wye branches. Backfilling shall be carefully done around these risers.

3.3 PRESSURE SEWER PIPE LAYING – GENERAL

- A. Before sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared and the necessary bracing and sheeting installed.
- B. Unless noted otherwise on the drawings, all pressure sewers shall be installed with a minimum of thirty-six (36) inches of cover.
- C. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the joints are completed or before the trench has been backfilled. The Contractor shall not open up at any time more trench than his available pumping facilities are able to dewater.
- D. Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in the trench. No section of pipe installation will be skipped without a written request for such procedures from the Contractor and approved by the Engineer.
- E. All pressure pipe 4 inches and over in diameter shall be provided with adequate thrust restraints. Thrust restraints, consisting of concrete thrust blocks and/or mechanical restraining rod attachment shall be furnished at all fittings, plugs, and all pipe bends as shown on the Drawings.
- F. Air release valves, Air/Vacuum release valves, and Combination air valves shall be installed at the locations shown on the drawings.
- G. A metallic tape or wire shall be installed in the same trench with all non-metallic pipe (PVC) in order that the pipe may be located with electronic metal detection equipment. The tape or wire shall be attached to the top of the pipe. Wire shall be T.W. 12-gauge solid copper conforming to specifications for annealed copper, ASTM B-3 and underwriters Laboratories Thermoplastic Insulated Wire Standard No. 83, latest revision. Wire shall be Simplex BW3001, or equal. Pipe detector tape shall be two (2) inches wide minimum metalized tape. Tape shall be Griffolyn Company, Inc., Terratape 2" D or equal. Wire and/or Tape shall be secured to pipe at intervals of 20 feet.

3.4 PIPE PROTECTION:

- A. Sewer pipe which, when completed, will have less than three (3) feet of cover, shall be provided with concrete protection and shall be constructed of ductile iron pipe.
- B. Where foundation conditions are not satisfactory, as determined by the Engineer, sewer pipe shall be either laid on a concrete cradle, sand backfill, foundation material, and/or constructed of ductile iron pipe as shown on the plans or as directed by the Engineer.

3.5 TESTING OF GRAVITY SEWERS AND MANHOLES:

- A. General:
 - 1. The approval and acceptance of gravity sewer lines and manholes shall be based on final testing. The Contractor must provide a 72-hour notice prior to final testing to the City Engineer. A representative from the Engineer and/or Owner must be present to witness final testing procedures. Tests performed in the absence of the Engineer's and/or Owner's representatives shall be considered invalid and shall be repeated by the Contractor.
 - 2. Final testing of gravity lines shall only be performed after all work adjacent to and over the pipeline has been completed. Trench backfilling, grading, roadway sub-grade, concrete work, other utility installation, and any other superimposed loads shall be completed and in place prior to final testing.

3. Prior to any testing and final inspection, all gravity lines shall be cleaned of debris and flushed clean with water as necessary by the Contractor. Debris and flush water shall be contained at a lower manhole and removed from the line. Debris and flush water shall not be allowed to enter live existing sanitary sewers. Contractor shall be responsible for collection and proper disposal of debris and flush water.
 4. All apparatus and equipment required for testing shall be furnished by the Contractor.
 5. Contractor shall provide the Engineer and Owner with copies of all field notes and documentation obtained during final testing.
- B. Scope:
1. All gravity sewers shall be tested by one or more of the following methods as directed by the City Engineer:
 - a. Direct Visual Inspection by the Engineer
 - b. Exfiltration of water
 - c. Infiltration of water
 - d. Exfiltration of air under pressure (Low Pressure Air Testing)
 - e. Video Inspection.
 2. In addition to the above testing requirements, all PVC gravity sewers shall pass mandrel testing to verify roundness and proper installation.
 3. All manholes shall be vacuum tested.
- C. Direct Visual Inspection by the Engineer
1. The Engineer and/or his Representative shall visually inspect all gravity sewer pipe installed to verify alignment and ensure the pipe is free from obstructions and debris. Each segment of sewer shall be "flushed" using sunlight and mirrors. When the full diameter of the pipe is visible between adjacent manholes, the segment of pipe is deemed properly aligned and free of sags and debris.
 2. If segment of pipe fails visual inspection, the pipe shall be cleaned and/or replaced and re-tested by the Contractor.
- D. Exfiltration of Water
1. The section of sewer to be tested shall be sealed by inserting inflatable rubber bags or plugs in the pipes or by other means approved by the Engineer. Water shall then be introduced into a manhole until the pipeline section is completely filled. The Contractor shall fill the pipe to the required test level prior to the time of exfiltration testing to permit normal absorption into the pipe walls if concrete or concrete lined ductile iron pipe is being tested. Throughout the test period of two (2) hours minimum, the water level in the upper manhole shall be maintained at least 18-inches above the crown of the upper end of the pipe or at least 18-inches above the groundwater table, whichever is greater. The length of pipe tested shall be limited such that the pressure on the centerline of the lower pipe end tested does not exceed six (6) feet water column.
 2. Exfiltration of water shall not exceed 100-gallons per mile of sewer per inch of inside diameter per 24-hours in any section of the completed work. In no case shall the exfiltration of water exceed 2500 gallons per mile per 24 hours. All observed leaks shall be corrected by the Contractor even though exfiltration is within the allowable limits.
 3. The Engineer may direct the Contractor to test selected sections of the sewer in the following manner: after the selected sections of the sewer are laid in the trench and the joints completed but before any backfill is placed, the Contractor shall install suitable bulkheads or stoppers in each end of the sewer and fill the sewer with water. The sewer shall be filled through one length of sewer pipe installed vertically at a wye or at the end of the pipe being tested. Water shall be maintained in the line approximately to the top of the fill pipe until the Engineer can inspect the section of sewer being tested. Any leaks in the sewer system being tested shall be repaired by the Contractor. The total amount of sewer thus tested shall not exceed five percent (5%) of the total length of sewer constructed. Should the results of any of these tests indicate leakage, the

Engineer may direct the Contractor to change the methods of construction to reduce the leakage on the remaining part of the work.

E. Infiltration of Water:

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

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

1. Scope
 - a. This recommended practice defines the proper procedures for acceptance testing of installed gravity sewer pipe, using low-pressure air, to provide assurance that the pipe, as installed, is free from significant leaks. Included are requirements for equipment accuracy, safety precautions, line preparation, test method, and minimum holding times. This recommended practice does not cover the testing of manholes. All new pipe shall be low-pressure air tested to insure the integrity of the pipe and joints
 - b. Only lines tested after backfilling to final grade will be considered for acceptability. However, this test may also be used by the installer as a presumptive test to determine the condition of the line prior to backfilling. At no time will more than four manhole to manhole reaches of pipe be installed before air testing is performed.
 - c. Low Pressure Air Testing shall be conducted in accordance with ASTM C828, C924, F1417 and UBPPA UNI-B-6.
2. Responsibilities:
 - a. Responsibility of the Contractor: Unless otherwise specified, the Contractor shall furnish all the necessary equipment and be responsible for conducting all low-pressure air tests. In addition, the Contractor is responsible for any necessary repair work on sections that do not pass the test. No sealant shall be used in any newly installed sewer without the prior approval of the Engineer. Proper structural repair work will be required by the Engineer or the Owner.
 - b. Responsibility of the Engineer: The Engineer and/or a qualified inspector shall witness all low-pressure air tests and verify the accuracy and acceptability of the equipment utilized. The engineer should inform the Contractor regarding acceptable methods of repair in the event one or more sections fail to pass the low-pressure air test. The Engineer should also report to the Owner regarding the acceptability of the Contractor's work.
 - c. Responsibility of the Owner: The Owner shall make a final decision as to the acceptability of the Contractor's work based upon the Engineer's recommendation.
 - d. Regulatory Agencies: Regulatory Agencies in the State, Federal, and/or local level may be legally entitled to witness any air testing and/or review the results. The Owner or his Engineer should check to see that the low-pressure air test specified for his installation is at least as stringent as those which may be required by such regulatory bodies.

3. Equipment

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

4. Line Preparation

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

5. Test Procedure

- a. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to the manufacturer's recommended inflation pressure. The sealed pipe shall be pressurized to 9 PSIG. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
- b. After a manhole to manhole reach of the pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to manufacturer's recommended inflation pressure. When plugs are being placed, the pipe adjacent to the manhole shall be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole.
- c. Low pressure air shall be slowly introduced into this sealed line until the internal air pressure reaches 4.0 PSIG greater than the average back pressure of any groundwater above the pipe, but not greater than 9.0 PSIG. If groundwater is present, refer to the following Paragraph 6. Determination of Groundwater Elevation and Air Pressure Adjustment , of Section 3.5.F in this Specification.
- d. After a constant pressure of 4.0 PSIG (greater than the average groundwater back pressure) is reached, the air supply shall be throttled to maintain the internal pressure for at least 2 minutes.

- e. When the pressure has stabilized at 4.0 PSIG, the air hose from the control panel to air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 PSIG. At a reading of 3.5 PSIG, or any convenient observed pressure reading between 3.5 PSIG and 4.0 PSIG, timing for the test may begin.
- f. The portion of line being tested shall be termed "Acceptable" if the allocated line pressure decreases less than one PSI in the time shown for the given diameters and lengths in the following table. Consult the City Engineer for test lengths greater than those provided.

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP

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

- g. If there has been no leakage (0 PSIG drop) after one hour of testing, the test section shall be accepted and the test complete. If there is any pressure drop, the complete test shall be run to determine whether or not the test section is acceptable.
 - h. If the pressure drops 1.0 PSIG before the appropriate time shown in the table has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.
 - i. If the section fails to meet these requirements, the Contractor shall determine the source(s) of leakage, and he shall repair or replace all defective materials and/or workmanship to the satisfaction of the Engineer. The extent and type of repair which may be allowed, as well as results, shall be subject to the approval of the Engineer. The completed pipe installation shall then be retested and required to meet the requirements of this test.
6. Determination of Groundwater Elevation and Air Pressure Adjustment
- a. In areas where ground water is known to exist, the Contractor shall install a ½-inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall directly on top of one of the sewer lines entering the manhole. A permanent, watertight seal shall be provided around the pipe nipple at the manhole wall. This shall be done at the time the sewer line is installed.
 - b. Immediately prior to the performance of the air testing, the ground water shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The plastic tube shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.31 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig. This will increase the 3.5 psig (mentioned in item e above) to 8.5 psig, and the 2.5 psig to 7.5 psig.)
 - c. The allowable pressure drop of 1.0 PSIG and the timing in the previous table are not affected and shall remain the same.
 - d. In no case shall the starting test pressure exceed 9.0 PSIG. If the average vertical height of groundwater above the pipe invert is more than 12.7 feet, the section so submerged may be tested using 9.0 PSIG as the starting test pressure.
 - e. After determining the air pressure adjustment, the test shall resume according to Item 5 - Test Procedures stated above.

- f. After determining groundwater height, each pipe nipple shall be recapped and sealed to prevent future infiltration.

G. Video Inspection:

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

H. Mandrel Testing:

1. Mandrel test (deflection test) shall be performed by the Contractor in order to verify the roundness and proper installation of the PVC gravity sewer line.
2. Equipment systems used to perform mandrel tests shall be specifically designed for the pipe material being tested. Mandrels that do not specifically state the size and type of piping for which it is applicable shall not be allowed.
3. Deflection Test:
 - a. The deflection test shall consist of testing PVC gravity sewer pipe for proper installation by the method outlined (see ASTM D3034). The testing shall be accomplished prior to final acceptance, but at least 30 days after the pipe has been backfilled completely to permit stabilization of the soil-pipe envelope.
 - b. After the pipeline has been installed and backfill materials have been compacted to their required standard densities, the mandrel shall be pulled by hand through the pipeline with a suitable rope or cable that is connected to an eyebolt at one end of the gauge. A similar rope or cable shall be attached to the eyebolt at the opposite end of the mandrel and tension shall be applied to it. This will insure that the mandrel maintains its correct position during testing and also to remove the mandrel if it should become lodged in an excessively deflected pipeline. Winching or other mechanical means of forcing the mandrel through the pipeline is unacceptable. Pipeline deflection testing shall have a deflection not exceeding 5% of the base inside pipe diameter as established by ASTM Standards D3034 and F679.
 - c. Permanent record of all testing with locations where excessive pipeline deflections occur shall be kept by the Contractor and forwarded to the Engineer after completion of testing on each line.
 - d. The Contractor shall immediately correct or replace all sections of pipe which deflect more than 5%.
 - e. All material and labor required for testing and/or replacement of pipelines shall be furnished by the Contractor.
 - f. Pipelines requiring correction and/or replacement shall be retested after an additional 30 day backfill stabilization period.

I. Manhole Vacuum Testing:

1. Vacuum tests shall be conducted on newly constructed manholes. Preliminary manhole testing shall take place following construction after all connections are made, and before backfilling. Test results derived from this test will allow time for necessary repairs to be completed before further construction proceeds and hinders such repairs. Final tests must be performed after the manhole has been backfilled.
2. Equipment:
 - a. Manhole vacuum tester assembly and vacuum pumps shall be manufactured by Cherne Industries, Inc., or approved equal.

- b. Pneumatic plugs shall be manufactured by Cherne Industries, Inc. or approved equal. These plugs shall have a sealing length equal to or greater than the diameter of the connecting pipe to be sealed.

3. Procedures:

- a. Plug all manhole entrances and exits other than the manhole top access using suitably sized pneumatic or mechanical pipeline plugs and follow all manufacturer's recommendations and warnings for proper and safe installation of such plugs. Plugs should be inserted a minimum of 6" beyond manhole wall. Make sure such plugs are properly rated for the pressures required for the test. The standard test of 10" Hg. (mercury) is equivalent to approximately 5 PSIG (0.3 bar) backpressure. Unless such plugs are mechanically restrained, it is recommended that the plugs are used with a minimum of two times (2x) safety factor or a minimum of 10 PSIG (0.7 bar) backpressure usage rating.

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

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

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

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

Minimum Test Times for Various Manhole Diameters

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

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

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

3.6 TESTING OF FORCE MAINS

A. General:

1. This Section shall cover testing of sanitary sewer force mains for pipe sizes of four inches (4") in diameter and larger for flushing, hydrostatic pressure and leakage. Testing shall be accomplished so that all portions of the system are flushed and tested according to these requirements. These requirements are for both Ductile Iron and Polyvinyl Chloride (PVC) Pipe. The Contractor shall furnish test equipment, labor, materials, and water for all tests. All test equipment shall be approved by, and meet the requirements of, the City Engineer for the City of Tuscaloosa.
2. The Contractor must provide a 24-hour notice prior to final testing to the City Engineer.
3. All apparatus and equipment required for testing shall be furnished by the Contractor.
4. Contractor shall provide the Engineer and Owner with copies of all field notes, documentation, and recording charts obtained during final testing.

B. Flushing:

1. Prior to beginning the pressure test, the line shall be flushed to remove all dirt and debris trapped in the line.
2. All valves shall be partially opened and closed during the flushing process.
3. All lines shall be flushed with a velocity of at least two and one-half feet per second (2.5 fps).
4. The Contractor is responsible for the proper disposal of all flushed water.

C. Testing:

1. Before applying the specified test pressure, all entrained air shall be expelled completely from the section pipe under test. Air shall be bled from the highest elevations in the line. If permanent air vents are not located at the high points in the test section, corporation cocks meeting the approval of the City Engineer shall be installed at such points so that air may be expelled as the line is filled with water. At the conclusion of the pressure test, the corporation cocks shall be removed and tightly plugged, or left in place at the direction of the City Engineer.
2. All exposed pipe, fittings, and joints shall be examined carefully during the test. Any damaged or defective pipe or fittings or any visible or audible leaks, discovered during or following the pressure test shall be repaired or replaced, regardless of the pressure test results, with sound material by the Contractor. The test shall be repeated until the results are satisfactory to the City Engineer.
3. The Test Pressure shall be the Working Pressure of the line as defined below, but in no case less than one hundred pounds per square inch (100 psi).
 - a. The Working Pressure shall be defined as one and on-half (1.5) times the shut-off head of the system pump or as defined by the City Engineer.
4. Leakage shall be defined as the quantity of water that must be supplied into the section of pipe being tested to maintain pressure within ± 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

5. Upon complete removal of all air entrapped in the line, the line shall again be filled with water and pressurized to the required test pressure. The line shall be allowed to stabilize at the test pressure for a minimum of four (4) hours before conducting the pressure test.
6. Duration of the test shall be two (2) hours for uncovered pipe and six (6) hours for covered pipe. The test pressure shall not vary by more than plus or minus five pounds per square inch (± 5 psi) during the duration of the test. The specified test pressure shall be applied by means of a pump connected to the pipe.
7. A recording pressure gauge approved by the Engineer shall be installed and pressure fluctuations recorded for the duration of the test. For each test, copies of all test charts and records shall be furnished to the Engineer.

D. Acceptance:

1. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified, the failure shall be located and repaired using approved materials and acceptable construction practices until the leakage is within specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.
2. Maximum allowable leakage in a test period shall not exceed:

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

where: L = allowable leakage in gallons per hour

S = length of pipe tested in feet

D = nominal diameter of pipe in inches

P = average test pressure during the leakage test in pounds per square inch, gauge (psig)

3.7 CLEAN-UP AND GRASSING:

- A. After the ditch lines have been sufficiently compacted, all excess material shall be removed from the job site by the Contractor.
- B. Any trees or undergrowth shall also be removed by the Contractor.
- C. All disturbed areas shall have topsoil replaced equal to that before construction began. If necessary, the Contractor shall provide topsoil.

END OF SECTION 332722

SECTION 332729 - THRUST RESTRAINT

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. All pressure pipe 2-inches and over in diameter shall be provided with adequate thrust restraints. Thrust restraints, consisting of concrete thrust blocks and/or mechanical restraining rod attachment shall be furnished at all hydrants, valves, fittings, plugs, and all pipe bends 11-1/4-degrees or greater.
- B. Concrete used for thrust backing shall be 2000 psi min. Concrete thrust blocks shall be poured against undisturbed earth having sufficient bearing strength to support the thrust load.
- C. Tie rods and clamps shall be installed where shown on the drawings and as needed. Tie rods and clamps shall be of an approved design and shall be protected against corrosion by a field coat of bituminastic coating hand applied before and after installation.
- D. Thrust blocking shall comply with the charts outlined in the standard details and adjusted for pressures or soil bearing strengths that differ from those used in the chart.

1.2 PAYMENT:

- A. No separate payment shall be made for thrust restraint. Costs shall be included in the price of the piping.

END OF SECTION 332729

